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PAPER RECYCLING IN ONTARIO

Dr. J. A. Donnan,
Environmental Approvals Branch

August, 1976

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PREFACE

This study of waste paper markets in Ontario is one of a number of studies and projects carried out by the Resource Recovery Branch of the Ministry of the Environment, as part of the Comprehensive Resource Recovery Programme initiated in the fall of 1974.

This programme calls for the concurrent development of technology, and of markets for recovered materials, not only in relation to large, mechanical processing plants dealing with mixed municipal waste as collected, but for the at-source separation of residential, commercial and industrial wastes.

Because of existing practices and available technology in the pulp and paper industry, this particular study is directed primarily towards the marketing of waste paper obtained by at-source separation.

Although large quantities of a paper-rich fraction can be separated at mechanical processing plants, the technology is not presently available for fibre separation which might enable this material to be used by the pulp and paper industry. The principal

..... 2/

value of this fraction for at least the next decade is likely to be for the production of energy, and, in relatively small quantities, for some of the alternative uses briefly described in this report such as insulation, or sewage sludge conditioning.

The recommendations for government action contained herein represent the views of the author, and not necessarily those of the Ministry of the Environment. However, it may be of interest to note that action has already been initiated on two of the approaches described. A joint study, in co-operation with the Ministry of Government Services and the Federal Government, is being undertaken to determine the feasibility of collecting marketable waste paper from government buildings in the Toronto area. In addition, a pilot project on the desk top separation of fine office papers is underway at the offices of the Resource Recovery Branch and the Waste Management Advisory Board.

This report was prepared for the Resource Recovery Branch by Dr. J. A. Donnan, Economic Analyst, Environmental Approvals Branch of the Ministry, and the co-operation of the Environmental Approvals Branch, and the time and effort expended by Dr. Donnan in addition to his other duties, is very much appreciated.

August, 1976

W. Williamson, P. Eng.,
Director,
Resource Recovery Branch

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The author would like to thank Mr. Harry S. Spencer, P. Eng., former consultant to the pulp and paper industry, for his invaluable assistance during the research phase of the study. The comments and suggestions made by Mr. Boris Boyko, P. Eng., Manager, Technology and Market Development Section, Resource Recovery Branch, during the drafting of the report were also very much appreciated.

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CHAPTER I

WASTE PAPER RECYCLING IN ONTARIO: A SUMMARY

An analysis of the markets for waste paper in Ontario and Canada was undertaken with three primary objectives:

1) to provide a better quantitative and qualitative understanding of these markets,
2) to determine present and potential uses for waste paper other than making paper, and
3) to specify and evaluate various government policies which are intended to increase recycling.

Virtually all waste papers that are recycled are utilized by the pulp and paper industry. Therefore, consumption of waste paper, or, as it is called by the industry, paper stock, is governed by the technical, economic, locational and historical conditions which face this industry. The waste paper market system itself consists of four primary components: generators, dealers, waste paper consuming mills, and the customers of paper products.

There are more than forty different paper stock grades, each with different characteristics, uses, and prices. These paper stock types can be aggregated into premium grades which include pulp substitutes and de-inking papers, and bulk grades such as old corrugated boxes, newspapers, and mixed papers. Pulp substitutes and de-inking grades are basically industrial scrap generated in large, clean, homogeneous quantities. These papers seldom, if ever, find their way into the solid waste stream. Waste news, corrugated boxes and mixed papers are often discarded as consumer-type wastes in small, heterogeneous and contaminated quantities.

The twenty paper mills in Ontario which use paper stock currently consume about 425 000 tons annually, of which approximately 90 000 tons of waste paper (primarily premium grades) are imported. Consequently, about 20 percent of the waste paper which is potentially recoverable in Ontario is in fact recycled.*

Almost 90 percent of the waste paper used in Canada is consumed by the boxboard, container board and building board sectors of the paper industry. Moreover, boxboard and building boards use nearly all of the bulk grades that are consumed. Only de-inking and pulp substitute grades are used in the manufacture of wrapping, fine and tissue papers. Most significantly, virtually no waste paper is used in the manufacture of newsprint, the industry's most important product in terms of tonnage. There are sixteen mills in the province (nine of which are newsprint mills) which use little or no paper stock.

The demand for premium grades is generally strong and persistent. Virtually all de-inking and pulp substitutes that can be recovered can be sold so long as the material is free of contaminants. However, supplies of these grades are somewhat limited. Recovery of additional premium grades under the prevailing market conditions and structure would involve higher costs for sorting, storage and collection. On the other hand, supplies of bulk grades are invariably in excess of demand. These commodities are also vulnerable to wide shifts in demand and price. Consequently, government efforts at expanding paper recycling should be directed at increasing the supplies of premium grades and the demand for bulk grades.

---

* From Table V-1. approximately 1 700 000 tons of waste paper are potentially recoverable during one year in Ontario.

Demand for waste paper originates with pulp and paper mills, dealers having virtually no impact on demand at all. Waste paper prices are generally set by paper mills except during periods of rapidly rising demand when dealers can extract higher short-run prices for their available supplies. However, ease of entry into the business and competition for suppliers and customers precludes any dealers from manipulating, on a sustained basis, the prices of waste paper to generators or to mills.

An individual mill's consumption of waste paper depends on its technical capabilities, the quality specifications of its products, and the cost of waste paper relative to the cost of virgin pulp. Total market demand for waste paper depends primarily on the demand for paper products and the relative cost of paper stock. The supply of waste paper is determined almost entirely by price. The higher the price of waste paper, the more costs dealers can incur to collect, sort, and transport the material. All grades of waste paper are generally being recovered to the extent that it is economically feasible for the market participants to do so.

A necessarily superficial examination of waste paper transportation revealed no evidence of shipping rates that discriminated against waste paper. Rail "class" rates for waste paper are exactly the same as wood pulp and pulpwood. However, paper mills are often able to negotiate substantially lower rates for pulp or logs because they ship large quantities frequently. Waste paper, on the other hand, is not shipped frequently enough or in large enough quantities to warrant the lower negotiated rates which integrated pulp and paper mills are able to obtain.

A number of factors act to limit paper recycling by constraining the demand for and the supply of waste paper:

1. Factors which constrain demand
    - a) fluctuation in demand and price of paper stock,
    - b) lack of new products made from waste paper, especially bulk grades,
    - c) slow growth in boxboard and building board product sectors,
    - d) location and design of existing pulp and paper manufacturing facilities favour primary wood pulp,
    - e) quality specifications of final products favour the use of primary wood pulp.
2. Factors which constrain supply of premium grades
    - a) efficient, low cost solid waste collection and disposal systems make it cheaper and more convenient to discard rather than recover,
    - b) increasing contamination of waste paper,
    - c) logistic and operational problems affecting dealers and generators,

d) supply of economically available premium grade waste paper is limited under current market conditions.

Of the other uses of waste paper that were studied, energy recovery and the manufacture of an insulation material from waste newspapers appear to have the greatest, immediate potential for expanding waste paper consumption. These uses are especially attractive in view of rising energy prices. Other potential uses will require substantially more research or development before they could have any impact on waste paper demand.

The benefits of increased paper recycling were evaluated. Conservation of forests could be achieved only if wood pulp consumption would be displaced by waste paper pulp. Increased recycling of paper would result in a somewhat reduced rate of landfill depletion but savings in the costs of landfill operations would be relatively small even if the consumption of waste paper were doubled in Ontario. Increased paper recycling would not necessarily reduce solid waste generation. Because waste paper collection, sorting and handling is more labour intensive than tree harvesting, it is possible that increased paper recycling would result in a net increase in employment in the province. Since the benefits of increased paper recycling are somewhat limited and difficult to quantify, allocation of public resources (funds and personnel) to recycling programmes must be done judiciously.

However, if left entirely to market forces, it is unlikely that waste paper recycling will ever increase to the extent that wood pulp production would be displaced or measurable savings in the financial and environmental costs of solid waste disposal would be achieved.

A number of possible provincial government actions intended to increase the demand for and the supply of particular grades of waste paper were evaluated. The ability of the provincial government to directly increase the demand for bulk grades and the supply of premium grades is somewhat limited. However, provincial government policies and programmes provide an important example to other sectors of the economy.

Five demand options and two supply options were identified as feasible for implementation. Five recommendations which incorporate these options are presented in Chapter X. These include:

1) implement a recycling programme within the Ontario government,
2) encourage investment in recycling facilities, particularly waste news de-inking,
3) develop other uses for waste paper,
4) maintain data and information files,
5) provide information to consumers on recycled content and on products which are difficult to recycle.

CHAPTER II

INTRODUCTION

RECYCLING AND SECONDARY MATERIAL MARKETS

While recycling has become an increasingly popular and apparently desirable alternative to burning and burying solid wastes, the actual degree of recycling in the United States and Canada has been declining steadily for the past five decades. Materials recovery has been generally labour intensive so that recycling has become an increasingly expensive, hence diminishing, occupation.

The new interest and efforts in recycling were spurred by other than economic factors, but there may be some good reasons why an increased level of recycling in Ontario and elsewhere is socially desirable. First of all, a number of environmental benefits are claimed for recycling which are not reflected in the prices or costs that face secondary materials market participants. These possible benefits include a reduction in environmental damage associated with natural resource exploitation, a reduction in the production of solid wastes, and the conservation of natural resources.

Government efforts to increase the rate of recycling are further justified if other government policies inhibit the activity. Provincial policies aimed at promoting the location of pulp and paper mills in the northern forests may be inhibitory to recycling paper. Finally, there may be economies of scale inherent in recovering materials from certain institutions, such as the government, which private firms have neither the resources or the authority to organize. The important question is whether the benefits of increased materials recycling offset any additional costs of implementing this approach.

Virtually all recycling programmes that have so far been initiated in the United States and Canada have been directed only at separating and extracting materials or energy from solid wastes. The utilization of the recovered materials was left to existing private market and manufacturing systems. Under the market system, secondary materials are used to the extent that they are cheaper than "natural" or "virgin" materials, given the technology in use. However, secondary materials markets are notoriously unstable and unpredictable. Here in Ontario, an increased effort on the part of environmental groups and several municipalities to collect newspapers for recycling was all but abandoned when the market for these materials collapsed in October, 1974.*

It follows, then, the markets for secondary materials must be expanded if recycling is ever to become a viable method of solid waste disposal. An understanding of the markets for the various secondary materials is, therefore, essential to the development and assessment of policies and programmes intended to increase the amount of recycling in the economy.

---

* The term "collapse" is entirely appropriate here because, after October, 1974, waste paper dealers would not accept any waste newspapers that were being collected by several of the Metropolitan Toronto Boroughs.

OBJECTIVES OF THE STUDY

The present study is an investigation of the present and potential markets for waste paper in Ontario and Eastern Canada. Waste paper is of particular interest at this time for several reasons. First, paper is the largest single component of municipal solid wastes, accounting for between 35 and 50 percent of the total composition by weight(1). Secondly, newspaper recycling programmes in Ontario have generated a substantial amount of interest and disappointment over the past three years. Municipalities in Metro Toronto and elsewhere have collected many tons of waste newspapers which the paper industry has not been able to use. Finally, paper is the most obviously recyclable of all post-consumer wastes which many individuals and organizations feel compelled to do something about.

The current investigation has three primary objectives. First, it is intended to provide a more complete quantitative and qualitative understanding of the existing markets for waste paper in Ontario and Eastern Canada. With this enhanced understanding of the market, the various factors which constrain the demand for, and the supply of, waste paper for recycling will be analyzed. The second objective of the study will be to suggest and evaluate policies which the government, especially the Provincial Government, might adopt to increase the utilization and, where appropriate, the supply of waste paper in Ontario. The third objective is to identify and evaluate present and potential uses for waste paper other than to make more paper.

Certain types of waste paper have been consistently recovered by the salvage industry and have never been a significant part of mixed municipal garbage. Consequently, an important focus of this study will be those waste papers which are presently discarded to landfills or incineration.

Several studies of waste paper markets in Canada and Ontario have recently been completed(2, 3, 4, 5). These investigations provide a great deal of data, insight and background information concerning the use of waste papers by the pulp and paper industry in Canada and Ontario. Particular care has been taken, therefore, to try not to duplicate the substantial work that has already been accomplished. The present investigation will, to the extent possible, focus on topics which were not fully treated in those references.

REFERENCES: CHAPTER II

1. Peter Middleton and Associates Limited, A MUNICIPAL SOLID WASTE MANAGEMENT STUDY - VOL. 1 COMPOSITION AND QUANTITY: A CRITICAL EVALUATION OF EXISTING DATA. (Toronto: The Pollution Probe Foundation, 1975)

2. T. Burrell, R. McLeod and A. Taylor in co-operation with Peter Middleton and Associates Limited, A MUNICIPAL SOLID WASTE MANAGEMENT STUDY - VOL. 3 PAPER RECYCLING: A SOCIO-ECONOMIC PERSPECTIVE. (Toronto: The Pollution Probe Foundation, 1975)

3. Pollution Probe - Ottawa, RECYCLING IN EASTERN ONTARIO, (Toronto: Ontario Ministry of the Environment, February, 1975)

4. Pollution Probe - Toronto, MUNICIPAL PAPER COLLECTION, (Toronto: Pollution Probe, July, 1974)

5. T. E. Rattray, PAPER RECYCLING IN CANADA, mimeo (Ottawa: Solid Waste Management Division, Environment Canada, February, 1974)

CHAPTER III

ECONOMIC AND TECHNICAL CHARACTERISTICS OF THE PULP AND PAPER INDUSTRY

Virtually all recycled paper is used by the pulp and paper industry. Consequently, the consumption of paper stock is governed by the current technology, the prevailing economic conditions and the historical development of this industry. An understanding of the economic and technical characteristics of the pulp and paper industry in Ontario and Canada is then a prerequisite to any study of waste paper markets.

ECONOMIC ORGANIZATION OF THE PULP AND PAPER INDUSTRY

Products of the Pulp and Paper Industry

Pulp refers to the unformed, separated fibres which are used to make the wide variety of paper products produced by this industry. A listing of the major paper products manufactured in Canada is presented in Table III-1. Pulp may be made from a variety of fibrous materials but more than 90 percent of the paper products manufactured in North America today are derived from wood.*

Pulp and paper mills can be categorized in different ways but, for purposes of this study, the following product sectors are recognized:

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* Until the 1880's, cotton and flax were the principle fibre source for the paper industry. Some authorities believe that a new fibre source could become dominant by the end of this century.

TABLE III-1

PAPER PRODUCTS MANUFACTURED IN CANADA AND ONTARIO

1. Newsprint
    - (a) white in rolls
    - (b) groundwood specialities containing 50 percent or more groundwood

2. Book and printing papers containing less than 50 percent groundwood (often combined with fine papers for statistical purposes)

3. Fine papers - includes writing papers, bond, letterhead, duplicating, and papers of similar quality and intent

4. Tissues
    - (a) sanitary papers
        - i) towelling stock
        - ii) toilet tissue stock
        - iii) table napkin stock
    - (b) non-sanitary tissues

5. Bleached sulphite and/or bleached sulphate
    - (a) wrapping grades
    - (b) converting grades

6. Unbleached sulphate
    - (a) wrapping
    - (b) converting
    - (c) multiwall sack
    - (d) gumming and waxing

7. Unbleached sulphite or semi-bleached sulphate
    - (a) wrapping
    - (b) converting

8. Paperboard container grades
    - (a) liners, kraft
    - (b) liners, other

9. Corrugating board
    - (a) semi-chemical
    - (b) other

..... continued

TABLE III-1 - continued

10. Boxboard grades
    - (a) folding board
    - (b) non-folding board
    - (c) solid bleached board

11. Mill wrapper

12. Liner for plaster-board

13. Board for laminating into building-board

14. Core-board, take and drum stock

15. Shoe-board

16. Binders-board

17. Building-board
    - (a) building-board panels
    - (b) asphalted sheathing
    - (c) roof insulation board
    - (d) acoustic tiles and panels
    - (e) decorative

18. Mineral-board
    - (a) acoustical mineral tiles
    - (b) non-acoustic board

19. Hardboards

Source: 1974 Questionnaire to Pulp and Paper Mills by Statistics Canada, Census of Manufacturers.

1) Newsprint
2) Fine papers
3) Wrapping and coarse paper
4) Tissues
5) Paperboard
    a) container board
    b) corrugating medium
    c) boxboard
6) Building papers and board

These products are defined in more detail in Table III-2.

Quantitative Dimensions of the Pulp and Paper Industry in Canada and Ontario

The pulp and paper industry is a major economic force in both Canada and Ontario. The industry accounts for over 12 percent of the nation's export earnings and contributes heavily to both federal and provincial tax bases. Further evidence of the industry's national significance can be found in the publications of the Canadian Pulp and Paper Association (CPPA)(1). However, even these figures belie the qualitative importance of the industry to Northern Ontario where pulp and paper mills are the sole source of employment(2).

In 1974, Canadian mills produced 21.7 million tons of wood pulp, 42 percent of which was sulphate or kraft pulp(3). About 32 percent of this pulp production or 7.1 million tons was exported, over 50 percent of which went to the U.S.(4). Ontario mills manufacture about 20 percent of the nation's wood pulp output.

Newsprint is by far the most important paper product accounting for 57 percent of the Ontario paper production and more than 62 percent of the total Canadian paper and paperboard output.

TABLE III-2

PRIMARY PAPER PRODUCT GRADES MANUFACTURED IN CANADA

1. Newsprint

2. Book, bond, and writing papers

   This grade includes stationery, writing, printing, board and book papers. A representative grade is No. 7 bond.

3. Paperboard

   The distinction between paperboard and paper is not sharp, but broadly speaking, paperboard is heavier in basis weight, thicker and more rigid than paper. In general, all sheets .12 point (0.012 in.) or more in thickness are classified as paperboard. Paperboard is made from a wide variety of pulp furnishes on different types of machines. Paperboard made from waste paper is termed "chipboard". Three broad classes are recognized:

   (a) Linerboard: this is the paperboard used as the facing material for corrugated or solid-fibre boxes.

   (b) Corrugating medium: this is any paperboard that is used as the fluting material in corrugated boxes. Corrugating medium made from waste paper is termed bogus medium.

   (c) Boxboard: this is a general term which refers to the paperboard used for fabricating a wide variety of packages and containers. Paperboard may be made of wood pulp, waste paper or any combination of these. Several types of boxboard are:

      i) Folding boxboard: this is a paperboard possessing strength qualities that permit scoring and folding to make folding cartons. Clothing boxes are examples of this board.

      ii) Setup boxboard: this paperboard is used to make boxes in rigid form as contrasted with a folding or collapsible box. Setup boxboard is almost always made entirely of waste paper. Cereal and detergent boxes are made of setup board.

      iii) Solid bleached board: this is paperboard which is made entirely from virgin bleached kraft fibre and is used for frozen food boxes and milk cartons.

      iv) Other types of boxboard include automobile board, tube board, etc.

4. Tissues

   This grade includes sanitary papers such as toilet tissues, hand towels, food handling tissues, and facial tissue. Non-sanitary

..... continued

TABLE III-2 - continued

tissues include wiping papers for industry and some packaging materials.

5. Building papers

There are many types of building grades as indicated in Table III-1. The most important in terms of production tonnage are roof sheeting and boards to make gypsum panels.

6. Coarse grades

This grade includes the unbleached kraft papers used for wrapping and for making paper bags and sacks.

Source: American Paper and Pulp Association, Dictionary of Paper, 3rd Edition, New York, 1965.

The data in Table III-3 also show that Ontario mills produce over 55 percent of the fine paper made in Canada.* Almost 80 percent of the newsprint production in Ontario as well as all of Canada are shipped to the United States. Furthermore, an additional 1.5 million tons out of a total production of 5.4 million tons of other paper and paperboard products produced in Canada were exported in 1974(5).

Pulp and paper exports have several important implications which concern recycling. First, increased recycling in Ontario will not displace wood pulp which is being exported. Thus, exports will, to some extent, mitigate the degree to which recycling can achieve forest conservation. Second, it is likely that the provincial or federal government will be limited in the extent to which they can affect paper product quality characteristics or fibre composition of exported products in support of increased recycling. Finally, the United States is a major consumer of Ontario pulp and newsprint. Increased paper recycling in that country, especially waste news recycling, could have a greater impact on the Ontario pulp and paper industry than would expanded paper recycling here in Ontario itself.

Vertical Integration and the Geographical Patterns of the Pulp and Paper Industry

The pulp and paper companies in Ontario are components of a "North American" industry. This is a result of two factors. First,

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* The data in Table III-3 show quantities for 1971. While total output of paper products has increased substantially, the relative proportion of different products has not changed.

TABLE III-3

PRODUCTION OF PAPER AND PAPERBOARD IN CANADA AND ONTARIO, 1971

	CANADA		ONTARIO		
	000 Tons	% Total	000 Tons	% Canada	% Total Ontario
Newsprint	8,524.2	62.3	1,773.0	20.8	56.9
Book, printing, writing paper	930.5	7.1	513.6	55.2	16.5
Paperboard	1,871.3	14.2	638.0	34.1	20.5
Container grade	797.4				
Corrugating material	389.7				
Boxboard	685.0				
Wrapping paper	540.2	4.1	77.4	14.3	2.5
Tissue					
Sanitary	269.3	2.2			
Other	20.1		116.4	26.7	3.7
Building paper	147.0	1.1			
TOTAL	12,302.7	100.0	3,119.0	100.0	100.0

Source: Statistics Canada, Manufacturing and Primary Industries Division, Pulp and Paper Mills, 1971 (Ottawa: Information Canada, 1973) there are no tariffs or duties on market pulp, newsprint or waste paper which are shipped between the United States and Canada. Consequently, the U.S. and Canada can be considered as a single market area with respect to these commodities, and the various technical and economic characteristics of the industry are very similar between the two countries. Secondly, there is substantial ownership of Canadian pulp and paper manufacturing capacity by U.S. companies, and a number of Canadian companies have plants in the U.S. as well.

Vertical integration means that the various successive stages of production of a product are under the control of a single firm. The successive or vertical stages for pulp and paper production include logging, pulp production, paper making, converting operations (i.e. the manufacturing of corrugated boxes, envelopes, stationery, boxboard boxes, etc.) and, finally, the wholesale and retail marketing of the finished products.

Pulp and paper companies may be integrated backward in that they do their own wood harvesting and timber management. Some companies, such as Reed Paper Ltd. have acquired their own wastepaper dealer (formerly Krever Fibres Ltd.). All of the large Canadian paper companies are also integrated forward by operating converting plants and owning wholesale fine paper merchants. Companies, such as Ontario Paper, which has its mill in Thorold, and the Spruce Falls Mill in Kapuskasing, are both linked with newspaper publishers in the United States.*

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* It is interesting to note that there are no formal ownership links between Canadian newspaper publishers and paper manufacturers.

Much of the capacity of the industry is in the form of large, integrated mills located in the north near the forest resources. These integrated mills have productive capacities of between 700 and 1000 ton/day, are remote from population centres, and are generally dependent on wood as their only fibre source. These mills usually employ both chemical and groundwood pulping processes and they generally produce homogeneous products such as market pulp or newsprint.

Non-integrated mills tend to be relatively old, small (50-200 ton/day) and located near urban areas. They purchase their fibre supply (waste paper or market pulp) from and sell their products to unrelated firms. Some paper mills buy their waste paper fibre directly from generators or they have interests in paper stock dealerships. However, it is impossible to achieve the same degree of control over waste paper supplies as it is wood supplies. Non-integrated waste paper using mills usually produce a large variety of differentiated paper and board products.

Vertical integration is an important method for a firm to achieve both market stability and growth. It is undertaken by the firm to obtain secure supplies of raw materials and captive markets for its outputs. Vertical integration may result in lower costs by eliminating the profits of independent suppliers, by enabling the firm to capture economies of scale and by eliminating, in some instances, transportation and handling steps. Finally, it allows the firm to shift its profits to a particular processing or production level which has special tax concessions.

There are approximately four million tons of paper-making plant capacity located in Ontario(6). More than three million tons or 75 percent of this capacity comprise large, integrated pulp and paper mills located in Northern Ontario. The remaining 25 percent of the paper-making capacity in the province consists of mills which use waste paper to some extent and which tend to be smaller, non-integrated and located in the southern portion of the province. Paper manufacturers have, therefore, invested heavily in larger, integrated mills which are located near the forests and away from waste paper sources. Firms with large amounts of capital tied up in these mills are unlikely to invest in new competing facilities which use waste paper. The heavy commitment of the Ontario pulp and paper industry to integrated, wood-based chemical pulp production facilities in the north is, therefore, a limiting factor to the development of the waste paper-using segment of the industry.

The commitment to integrated, wood-using mills also contributes to price instability of waste paper. For these mills, waste paper is a supplementary fibre source. Paper stock is the last to be tried and the first to be abandoned when the industry goes through a period of virgin pulp shortage(7). Consequently, this "in and out" behaviour tends to accentuate the fluctuation in demand and prices experienced by the waste paper market.

Government Policies

Both the federal and provincial governments have contributed heavily to the development of the pulp and paper industry. This assistance has taken the form of tax concessions, allocation of wood limits, construction of roads by the government, special legislation and other less obvious activities. The extent and the history of these industry-government relations has been ably documented by Guthrie(8).

While government policies themselves may not have been direct barriers to increased recycling, they have contributed to the market trends and structural conditions that have inhibited growth in paper recycling. The policies of concern are of two types. First, there are the various policies and programmes carried out by both the federal and provincial governments to encourage development in the north. Various agencies of both the federal and provincial governments have worked closely with pulp and paper companies in planning, building and expanding mills in the northern regions of the province. It is, in fact, the stated objective of different federal and provincial agencies to encourage the development of northern areas through expansion of the industries already located there, particularly the pulp and paper industry.* These policies and programmes have helped direct the industry's investment to the north rather than to the south where waste paper would have been the natural fibre source.

The second government policy area that could be inhibitory to recycling is taxation. Canadian income tax regulations permit a paper company with certain types of timber limits to deduct 33 1/3 percent of all its profits from taxable income for a given tax year(9). The use of waste paper does not permit this deduction. In addition, the federal Department of Revenue classifies some waste paper dealers and brokers in such a way as to be ineligible for the accelerated capital cost allowances which manufacturing and mining firms are permitted. It may be argued that special tax concessions, where they are not available for the use of waste paper, help to make the ultimate costs of virgin materials lower relative to the costs of secondary materials.

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* The Federal Department of Regional Economic Expansion (DREE) and the Regional Planning Branch of the Ontario Treasury Ministry.

A quantitative determination of the extent to which these government policies have materially retarded the growth of paper recycling is beyond the scope of this present study. However, it is enough to note that federal and provincial government activities have long favoured development of the abundant natural resources of this nation, while ignoring the use of secondary materials. Reconsideration of these natural resource oriented policies may, therefore, be necessary to develop incentives for increased use of waste paper.

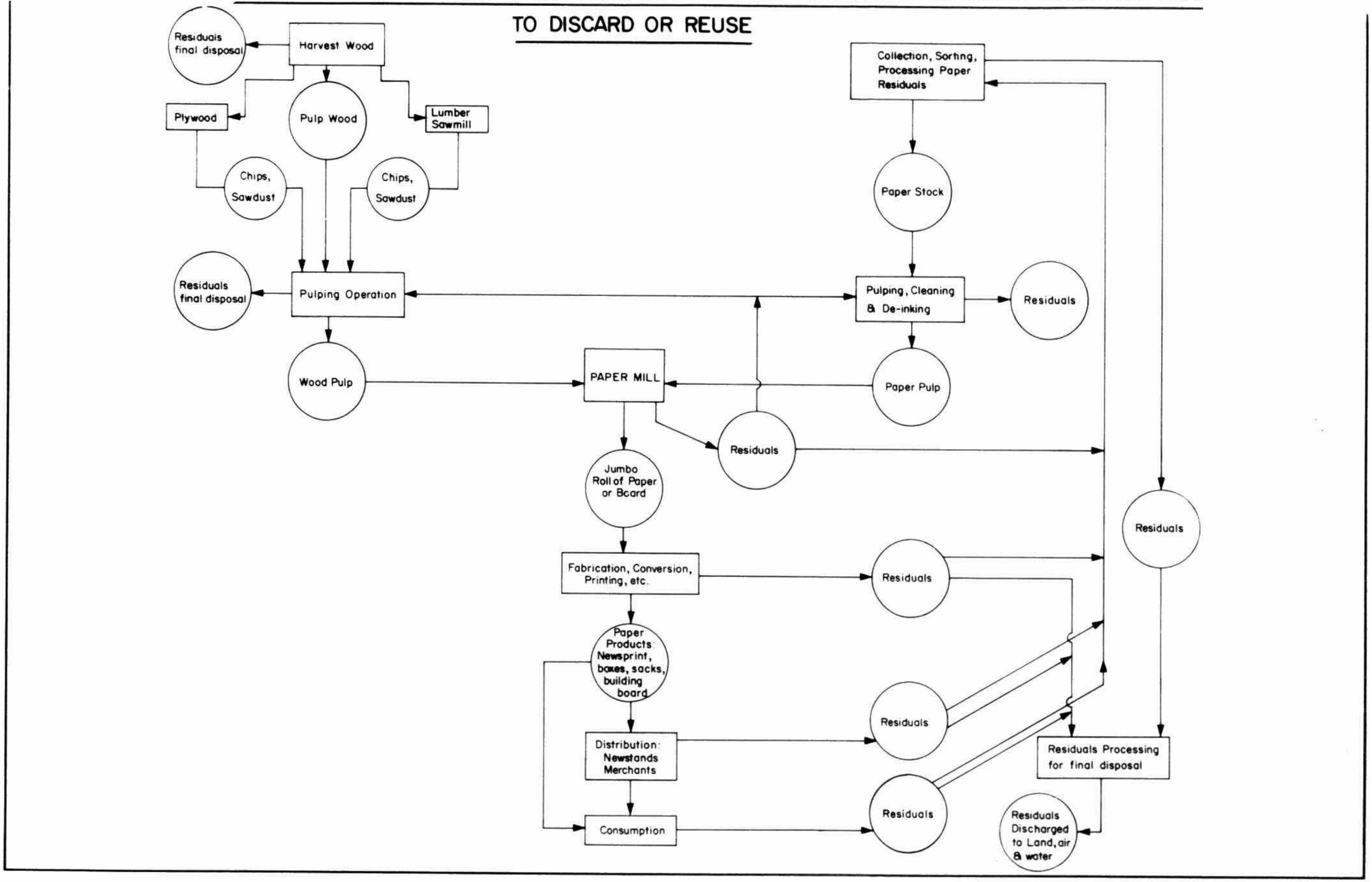
TECHNICAL CHARACTERISTICS OF THE PULP AND PAPER INDUSTRY AND PAPER RECYCLING

Pulp and Paper Industry System

The complete process of pulp and paper production is illustrated in Figure III-1. This shows the flow of paper-making fibres from their respective sources through the entire paper-making system. In this diagram, rectangles signify functional operations while the circles denote the products being processed and/or transferred. The diagram is necessarily simplified and portrays only the flow of fibre.

FIGURE III-1

FLOW OF PAPERMAKING FIBRES THROUGH THE PULP AND PAPER INDUSTRY FROM SOURCES TO DISCARD OR REUSE


Residuals final disposal
Harvest Wood
Plywood
Pulp Wood
Lumber Sawmill
Chips, Sawdust
Chips, Sawdust
Residuals final disposal
Pulping Operation
Wood Pulp
PAPER MILL
Residuals
Jumbo Roll of Paper or Board
Fabrication, Conversion, Printing, etc.
Paper Products: Newsprint, boxes, sacks, building board
Distribution: Newstands Merchants
Consumption
Collection, Sorting, Processing Paper Residuals
Paper Stock
Pulping, Cleaning & De-inking
Residuals
Paper Pulp
Residuals
Residuals
Residuals
Residuals
Residuals Processing for final disposal
Residuals Discharged to Land, air & water

In this representation, all matter and energy emerge from the various functions as either products or residuals. Residuals may be used as inputs into another production process or they may be discarded into the environment for final disposal. What is an input and what is to be discarded is entirely dependent on local, often transient, economic, technical and judgmental conditions.

Residuals or wastes are generated at each functional component of the system. Torn or otherwise defective paper, called mill broke, may be fed immediately back into the pulping operation. Rejected jumbo rolls, sheets and clippings or shavings are also generated at mills. These materials are used directly at the mill or are sold to other mills via dealers or brokers. Significant amounts of high quality residuals are generated during converting operations, particularly in the manufacture of corrugated boxes, envelopes and stationery and in the printing of newspapers and other papers.

Distribution residuals are somewhat unique to the newspaper and magazine segment of the industry. The value of these products is time dependent in that periodicals and newspapers not sold by a certain time are returned for subsequent disposal. A high proportion of conversion and distribution residuals are currently being recycled.

Final consumption of paper products occurs at all levels of the economy. Except for books, boards used in construction, files, and some other materials, paper products become residuals almost immediately after they have been used.

Figure III-1 shows that residuals may be directed into final disposal or back into the system via the secondary fibre or waste paper market.

Technical Aspects of Pulp and Paper Manufacture

Paper is a matted, or felted, sheet of fibres formed on a screen mesh from an aqueous suspension. Making paper consists of the following four basic functions:

1) obtaining a source of fibres (wood harvesting),
2) pulping,
3) preparing the aqueous suspension of fibres,
4) forming, pressing, and drying the paper.

Paper may be manufactured from almost any type of cellulosic fibre if the fibre is long enough. Prior to 1885, cotton and linen rags and some plant fibres, such as hemp, flax, and jute, were the primary fibre sources. However, the growth in demand for newsprint and other paper products quickly outdistanced these traditional fibre supplies and a new source of fibre was required.

Wood was abundant, hence cheap, so that commercial processes were developed in the late 1880's to tap this huge fibre source and satisfy the growing demand for fibres to make newsprint and other kinds of paper. Canada's vast timber resources thus gave it a natural competitive advantage for pulp and paper manufacturing.

A number of factors have converged in recent years to make wood a more and more expensive source of fibre. These forces include:

1) the increasing inaccessibility of usable wood,
2) the rising cost and, in some cases, the unavailability of labour to harvest wood in remote areas,
3) the growing demand for paper and paper products,
4) an expanding demand for other uses of forest land, such as recreation, which are often incompatible with intensive, efficient timber harvesting.

In an effort to extend its wood resources, the pulp and paper industry has utilized increasing amounts of wood residues (primarily chips and sawdust) in recent years. The quantity of wood residues used in Ontario rose from 661 000 cunits in 1972 to 952 000 cunits in 1974(10).* In the U.S., the increasing use of sawdust and sawmill chips over the past decade has been cited as an important factor in the decline in the use of waste papers by the paper industry(11). Although there is not enough data to establish trends, information from the CPPA shows that, from 1972 to 1973, the amounts of wood wastes used in Canada have increased relative to waste papers and paper stock(12).

Pulping refers to separating the individual fibres from each other. This is accomplished by the application of mechanical energy, chemical energy, or both. Mechanical pulping refers to the process of grinding the wood against stones in the presence of water. Chemical pulping, of which the sulphite and sulphate (or kraft) processes are the chief methods, involves cooking the wood in the presence of chemicals to dissolve the binding lignins. Chemically pulped fibres are longer and stronger than groundwood.

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* A cunit is 100 cu ft of solid wood.

In the older sulphite process, the wood is cooked in an acid solution whereas basic chemicals are used in the kraft process.*

Various species of wood are pulped by means of these processes, although the fibres derived from hardwood (deciduous trees) are shorter and weaker than those derived from softwood (coniferous trees). The different blends of wood fibres which are used to make papers are described in Table III-4.

Pulp, now called stock, is pumped to the head box of the paper machine where a wide variety of chemicals are added to achieve certain characteristics. For example, alum and rosin are used as sizing to prevent the blotting of ink; clay, calcium carbonate or titanium dioxide are included to give opacity; other additives include wet strength resins, dyes and starches. These additives are used by paper makers to give papers made from recycled fibres quality characteristics which are similar to papers made from virgin pulp.

There are two basic types of paper machines in use today: the fourdrinier machine and the cylinder machine. The essential difference between the two is the manner in which the sheet is initially formed. The sheet is formed by means of an endless moving screen mesh on the fourdrinier. On the cylinder machine, the sheet is formed on cylinder molds which revolve in vats filled with a pulp slurry. There may be up to ten cylinders on a cylinder machine which forms a multi-ply sheet. The fourdrinier machine always produces

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* The term "kraft" is derived from the German word meaning strong.

TABLE III-4

TYPES OF FIBRES AND PULPING PROCESSES THAT ARE BLENDED TO MAKE DIFFERENT GRADES OF PAPER

Types of Wood Used	Types of Pulping Processes	Grades of Paper
Cotton, linen, flax, hemp, ramie, etc.	Alkaline	Highest grade of fine papers; bank note; cigarette; rag-content fine papers.
Softwood Hardwood	Mechanical (usually blended with chemical)	News; catalogue; coated telephone directory; paperbacks.
Softwood Hardwood	Sulphite Sulphate (kraft)	Blended in various proportions for all types of fine and coarse papers. Blended with mechanical pulps to make news, hanging catalogues, coated paperbacks, directory.
Softwood Hardwood	Semi-chemical	Unbleached Corrugated and liner boards; newsprint; wrapping paper. Bleached Book, magazine, bond, writing, glassine, tissue; food board

a single-ply sheet up to 28 points (0.028 in.) in thickness. Cylinder machines produce multi-ply papers and boards of between 15 and 45 points in thickness.

Recycled papers and boards are commonly made on cylinder machines where low quality mixed paper layers are placed between liners made from higher quality fibres. Recycled fibre can be used on fourdrinier machines but, because of the loss of strength experienced in the recycling process, recycled papers and boards often have to be made thicker than the 28 point maximum allowed by this machine. Fourdrinier machines are generally preferred over cylinder machines because the former are faster, more reliable, and can use a wide variety of fibres. Improvements have been made to the cylinder machine to increase its speed and forming capability. These developments have helped further recycling within the industry.

The Quality Characteristics of Paper

The use of waste paper may alter the quality characteristics often in an undesirable manner. Consequently, the quality characteristics of paper are examined briefly in this section.

There are two broad types of quality characteristics of a paper product. Appearance refers to how the sheet looks and feels and involves colour, brightness and texture of the surface. Functional characteristics refer to the physical properties of the paper. Functional characteristics affect the ability of paper to be fabricated and the final use to which the product is put. Some of the more important measures of each of these two classes of quality characteristics are listed in Table III-5, along with a short explanation of the parameters. Some of the parameters have implications

TABLE III-5

PARAMETERS USED TO MEASURE QUALITY CHARACTERISTICS OF PAPER PRODUCTS

APPEARANCE CHARACTERISTICS

1. Finish: the surface property of a sheet is determined by its relative smoothness, gloss and appearance. Finish will also affect certain functional characteristics such as the ability of tab cards to slide over each other.

2. Brightness: often confused with colour. A higher bleached pulp produces a brighter or whiter paper. The standard test is such that, with 100 as a maximum, the higher the number, the brighter or whiter the sheet.

3. Cleanliness: this is indicated by a standard dirt count which measures the number and size of specks showing on the sheet surface. A numerical comparison is frequently used in specifications.

4. Opacity: the property of a sheet which obstructs the passage of light. The characteristic is important in "showthrough" of printing or writing.

FUNCTIONAL CHARACTERISTICS

1. Basis Weight: means the weight of a standard unit. The standard unit and dimensions for most paper products is 500 sheets (a ream) cut to 24 x 36 in. The basis weight of newsprint is, therefore, 30 lb per ream of 500 24 x 36 in. sheets. The metric equivalent is 30 grams per square metre. The unit size for boxboard is 25 x 40 in. for basis weight. For many other grades of paperboard, the basis weight is expressed in lb per 1000 sq ft (MFS).

2. Caliper: is the thickness of the paper, usually measured in thousandths of an inch. (.001 of an inch = 1 point) Uniformity of caliper is very important for products such as computer tabulating cards.

3. Sizing: refers to the resistance of the paper or board to penetration by water, ink, oil, milk, etc. One of many tests for sizing is the length of time required for a coloured solution to show through a sheet. Writing paper must be sufficiently hard sized to allow writing on it with ink.

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TABLE III-5 - continued

4. Ash Content: the inorganic residue remaining after burning a sheet of paper. The amount of ash remaining indicates the amounts of non-fibrous additives in the paper. Fillers are added to the furnish to impart certain characteristics - usually opacity.

5. Tensile: an important measure of strength. There are instruments to measure the actual amount of energy needed to pull a strip of paper apart.

6. Tear: another measure of strength or tear resistance. Tear can be measured by an instrument which records the amount of energy required to tear the paper.

7. Mullen (or pop test): another indication of strength of the paper, named after the man who invented the test. A diaphragm is forced against the paper, clamped over a one-inch aperture, until the paper is ruptured. A gauge records the intensity of energy. The higher the mullen, the more resistant the paper is to rupture or bursting.

8. Density or Bulk: a figure calculated by dividing the caliper by the basis weight. A bulky sheet is required in filter and blotting paper. Uniformity of bulk is important for proper printing and use in mechanical handling devices.

9. Stretch: the amount that a strip of paper will stretch before rupturing; expressed as a percentage of the length tested. This is an important quality for papers used on machines such as printing presses, bag machines, envelope-making machines, etc. It is an important quality in the finished product itself (such as bags, wall paper, etc.).

10. Curl: parameter referring to the tendency of a sheet to curl or not remain flat, especially under changing conditions of humidity. It is one of the most serious problems on printing presses fed by suction cups.

11. Stiffness: an important quality referring to the ability of paper or paperboard to resist deformation under stress.

12. Bending: property referring to the ability of a paperboard to bend without breakage. A full-bending board, when properly scored, may be folded 180° without showing pronounced failure of the top liner. A semi-bending sheet may be folded 90°; a paperboard used for the manufacture of folding cartons made of reclaimed paper stock must endure a single fold to 180° without breaking or separating the plies.

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TABLE III-5 - continued

13. Folding: is especially important in paper used for envelopes, currency, maps, blueprints, or any paper subjected to folding on a machine or repeated folding in use.

Source: American Paper and Pulp Association, *Dictionary of Paper*, 3rd Edition, New York, 1965.

for both appearance and function and are so noted. Table III-6 summarizes the quality characteristics which are most important to each of the primary paper product grades. How the inclusion of waste paper or paper stock will affect the appearance and function of the various paper products will be examined in the subsequent section.

Recycling of Paper - Contaminants

The growing level of contamination of waste paper has been cited as a primary obstacle to increased recycling(13). Most of the difficulties and disadvantages associated with using waste papers can be traced to contaminants. Two broad types of contaminants are identified. Outthrows are primarily unwanted papers while prohibited materials are basically non-fibrous contaminants.* Contaminants are either purposely combined with papers during converting, printing or packaging operations or they are unintentionally mixed with or stuck to papers during use or the act of disposal. These latter types of contaminants are called tramp materials. The growing levels of contamination are due primarily to the intentional binding and combining together of paper and other materials.

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* p. 4, Circular PS-74, Paper Stock Standards and Practices(14)

Outthrows are defined as "all papers that are so manufactured or treated or are in such a form as to be unsuitable for consumption as the grade specified".

Prohibitive materials are defined as:

(a) any materials which by their presence in a packing of paper stock, in excess of the amount allowed, will make the packing unusable as the grade specified.

(b) any materials that may be damaging to equipment.

TABLE III-6

QUALITY CHARACTERISTICS WHICH ARE PARTICULARLY IMPORTANT TO SELECTED PAPER PRODUCTS

Paper Product	Important Quality Characteristics
1. Fine papers	colour and brightness, cleanliness, finish, mullen, tear, tensile, folding, curling
2. Linerboard	tear (must be high), mullen (must be high), smoothness (for printing, this quality is not a necessity), brightness
3. Corrugating medium	crush (must be resistant), stiffness
4. Tissues	softness, absorbency
5. Newsprint	uniformity of brightness and colour, printing quality and finish, strength tests (a maximum of strength just to hold the paper together and run on high-speed printing presses without cracking)
6. Boxboard	appearance on outer layer (the appearance of outer sheet is very important to customers of boxboard), scoring and folding
7. Coarse papers	strength, tensile, mullen, etc.

Source: Midwest Research Institute and Franklin Associates, Inc., Paper Recycling - Impacts of Contaminants 1973-1985, N.Y.

The American Paper Institute, 1975, American Paper and Pulp Association, Dictionary of Paper, 3rd Edition, New York, 1965.

A list of the primary types of contaminants, their origins and their effects are presented in Table III-7. The materials most commonly cited as causing difficulties by dealers and paper mills today are:

1) hot melt adhesives used widely in packaging and publishing,
2) plastics,
3) synthetic fibres,
4) asphalts.

Outthrows and prohibited materials cause four types of problems:

1) difficulties during the paper manufacturing process (clogging pipes, breaking wires, sticking to driers, breaks, etc.),
2) deterioration of the functional characteristics of the final product (lower strength, slippery surfaces, poor printability, etc.),
3) deterioration of the appearance characteristics of the final product (spots, discolouration, dirt count, etc.),
4) potential danger to health.

Paper which is discarded in the solid waste stream without preparation is contaminated with grease, "dirt", bacteria, plastics, and innumerable other "tramp" materials(15). Moreover, the overall fibre composition varies from day to day. In short, the waste paper becomes contaminated and loses its homogeneity. It is not yet known whether newspapers or corrugated boxes which are bound up prior to

TABLE III-7

CONTAMINANTS COMMONLY FOUND IN WASTE PAPER

Contaminant	Source and Description	Problems and Effects			Comments
		Manufacturing	Paper Function	Paper Appearance	
1. Wet Strength paper	Photographic papers; papers are coated with insoluble resins	X		X	will not pulp without considerable application of heat and mechanical energy; can cause spots, lumpy paper
2. Hot melt adhesives and coatings	various uses	X	X		fouls equipment, defective products
3. Plastics	Polystyrene foam (blocks in packing, articles in domestic refuse)	X	X		difficult to remove (sticks to rolls, indents sheets, etc.
	dense plastic chips (from blister packs)	X	X	X	causes shiny and slippery surfaces
	films (laminated to paper or tramp materials)	X	X		slows down pulping, defective sheets
4. Latex	adhesives, rubber bands		X		
5. Pressure sensitive adhesives	package sealing, slices	X			can cause breaks in felts or webs, sticks to driers
6. Waxes	laminates or coatings	X	X	X	can foul equipment, creates slippery spots, impairs printability of product
7. Asphalt	paper board is laminated or coated with asphalt	X		X	sticks to wires, causes black spots

TABLE III-7 - continued

Contaminant	Source and Description	Problems and Effects			Comments
		Manufacturing	Paper Function	Paper Appearance	
8. Fibres	vegetable and synthetic threads and strands, sewn books, binding material, tramp material	X	X		plugs extractor plates and cleaning equipment; causes breaks in sheet
9. Non-fibrous additives	clay, calcium carbonate, titanium dioxide	X			material washed out in waste water - results in lost weight (less fibre than the mill paid for)
10. Dyes and pigments	coloured and dyed papers			X	washing and bleaching required to remove
11. Printing inks	printed papers			X	printed papers contain about 0.5 percent by weight of ink, washing and bleaching (de-inking) required to remove
12. Bacteria and Fungi	from organic contaminants		X	X	causes discolouration and cannot be used for sanitary tissues and food packaging
13. Odour	results from bacteria, fungi and other contaminants			X	an important quality problem for packaging

SOURCES: A.M. Altieri and J. W. Wendell, Jr., DEINKING OF WASTE PAPER (New York: Technical Association of the Pulp and Paper Industry), 1967, p 19-25.
Midwest Research Institute and Franklin Associates, Ltd., PAPER RECYCLING - THE IMPACTS OF CONTAMINANTS 1973-85 (New York: American Paper Institute, 1975), p 29.

collection will endure handling and transportation without becoming too contaminated for use by consumer mills.

The allowable limits of contaminants and outthrows have long been a topic of controversy among mills and paper dealers. To provide a set of standards against which quality might be assessed, the Paper Stock Institute of the National (U.S.) Association of Recycling Industries published its Paper Stock Standards and Practices, Circular PS-74, referred to henceforth as Circular PS-74(14). This document was prepared some time ago as a set of accepted business practices to which paper mills and paper stock dealers could refer in the event of a conflict or allegation of unfair practices. It is not binding on any of the participants in this market. While the limits for outthrows and prohibited materials are generally applicable in Canadian mills, waste paper users vary considerably in their tolerance to different types of contaminants and their ability to remove the offending materials. What may be prohibited material for one mill may be perfectly acceptable to another. Variations in the quantity and quality of contaminants cause problems for all mills regardless of their cleaning capabilities.

Contaminant problems may be resolved by action at several points within the market system:

1) making products more recyclable (i.e. reversing the trend to multi-material packaging, developing soluble and easily removed inks),
2) separation or avoidance of contamination by generators,

3) cleaning of pulp by centrifugal devices and screens within the paper mill,
4) sorting by dealers,
5) dispersion of the contaminant (such as asphalt) within the final product to the extent that it does not affect the product.

The pulp and paper industry has itself undertaken to correct some of the more obvious contaminant problems. Adhesive manufacturers have been approached to develop soluble adhesives to replace hot melts and to provide adhesive tapes that will pulp more easily.* The paper industry has also had a long association with ink manufacturers concerning removal problems.** It is important to realize that the adoption of more recyclable adhesives and inks will depend largely on the costs of these materials relative to their troublesome counterparts.

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* The Canadian Pulp and Paper Association has a committee which is working with adhesive manufacturers to try to develop inexpensive, water soluble adhesives which perform as well as the heat sensitive sealers. According to various sources, the use of water soluble adhesives would increase the costs of packaging because: 1. the adhesives are more expensive, and 2. packaging production lines would have to be slowed down.

** The question of using inks that are more easily removed or deinked is very complicated. Newspaper inks consist of carbon black in an oil vehicle. This is the cheapest ink available, a primary factor in its use. Another important factor is that the ink can be stored in large tanks for long periods of time without becoming tacky or clogging the feeder tubes. Presses can be started and stopped at will with a reliable, even flow of ink available at all times.

Some manufacturers and firms have taken unilateral steps to make products more recyclable.* However it appears that more definite governmental actions and support of the activities of other sectors of the economy are required to reverse the trends toward greater contamination.

Recycling - Cleaning and De-inking

Waste paper which is used to make building papers, container board, boxboard and coarse papers are pulped by means of mechanical agitation in water at 120-200° F. in what is called an hydrapulper. Debris, wires, plastics and other non-fibrous contaminants become wound around a chain, called a ragger, hanging in the stock and then are removed. The raggers are usually the first of several cleaning operations to which waste papers usually have to be subjected. Dyes, inks and other materials may be removed by de-inking. Once pulped and cleaned, secondary fibres are ready for basically the same stock preparation processes that are used for virgin fibres prior to paper making.

The cleaning devices and processes which can be used in a paper mill are listed in Table III-8 in order of their use. Although a given mill may not have all of these devices, these processes and equipment are designed primarily to remove or eliminate the effects of non-fibrous congaminants. Systems or devices have not yet been perfected that will separate different types of fibres

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* Bell Canada has instructed the firm which produces its phone books to use water soluble adhesives in the bindings and easily removable yellow dyes in its "Yellow Pages".

TABLE III-8

PAPER STOCK PULP CLEANING DEVICES USED IN PAPER MILLS

Device or Process	Mechanism of Removal	Acted Upon	Remaining Contaminant Materials
Pulper Junker	centrifugal force	rocks, metals, heavy objects	wires, strings, other light objects
Ragger	a chain which is dragged through the pulper; extracts materials	wire, string, plastic	sand, grit, small pieces of metal, plastics, adhesives, clumps of fibre
Precleaners	centrifugal	grit, sand, paper clips, dirt, some plastics	small particles
Screens	filtration	small particles of plastics, rubber bands, lumps of paper fibre	
Cleaners	centrifugal	particles small enough to pass through screens	some plastics
Deflakers	break down lumps of fibres that are small enough to pass through screens		
Dispersion	Pulp is treated with steam which breaks up asphalt, hot melts and other particles. Particles are dispersed further when steam and pulp are "blown" out of the digester chamber. Extremely tiny particles are dispersed through the pulp.	does not really remove anything	

SOURCE: Midwest Research Institute and Franklin Associates, Paper Recycling - The Impacts of Contaminants 1973-1985 (American Paper Association, 1975), p 23-27.

while they are in an aqueous state, although research along these lines is underway.(16).

Waste papers which are to be used for fine papers, tissues and newsprint must be processed further to remove inks, dyes, sizes and other additives by means of a process called de-inking. The process is essentially a laundering operation in which the various contaminants are dissolved or dispersed and the fibre is then bleached. The degree of processing to produce pulp for fine paper depends on the characteristics of the waste paper used. The details of the process are described in a TAPPI monograph(17). The Abitibi Provincial Mill in Thorold is the only fine paper de-inking facility in Ontario.

De-inking to make tissue products is similar to that for making fine papers. Groundwood waste paper can be used in making tissues whereas only chemical pulp waste papers are used in fine paper de-inking.

Newspaper de-inking can be accomplished by means of various combinations of cooking washing and chemical additives(18). The much publicized Garden State Paper Co. newsprint de-inking operations use a proprietary process, involving a detergent(19). Three Canadian-based paper companies which have analyzed the economic and technical feasibility of newsprint de-inking, indicate that the proprietary nature of the Scradder processes used by Garden State is not a barrier to the establishment of a waste news de-inking mill in Ontario.

Two types of newsprint de-inking mills have been assessed. A new integrated waste news de-inking mill could be built in which market pulp and/or newsprint would be manufactured. Economics of scale requires that such a mill have a capacity of at least 450 ton/day or an implied waste news consumption of about 170 000 ton/year (including losses)(20).

Another possibility is to establish a small waste news de-inking plant at an existing mill in order to increase pulping capacity. The Ontario Paper Co. of Thorold has been studying the feasibility of such a mill. This facility would use approximately 220 tons of newspapers per day or about 85 000 ton/year. The company has cited a number of reasons for not yet building the facility, including an ongoing assessment of long term expansion plans, uncertainties about newsprint demand and fluctuating newsprint prices.

Economic evaluations of newspaper de-inking plants have indicated that full size waste news de-inking mills were generally profitable(21, 22). Although newsprint de-inking mills involve substantially lower capital costs than comparable integrated wood pulp-newsprint mills, the profitability of a newspaper recycling mill is very sensitive to changes in the delivered cost of waste news. In addition, experience is an important factor in the successful operation of a de-inking mill since the start up cost of such facilities tends to be high. Because of waste news supply considerations and because of chronic limitations in the supply of capital, a smaller, supplementary facility added to an existing paper mill offers the greatest potential here in Ontario.

Waste disposal is an important consideration for the establishment of a de-inking mill.* Some authorities report that the manufacture of recycled grades of paper products has less of an environmental impact on air and water than does the production of papers from virgin pulp(24). The available data show that the de-inking mill in Ontario generates significantly less suspended solids and BOD_5/ton of product than a comparable fine paper mill in the province which uses only wood(25). However, de-inking processes do generate waste loadings which must be treated or discarded.

Energy consumption by recycling processes relative to the production of paper from logs is a subject of particular controversy. In two papers, Fooks and Langford concluded that the energy requirement for "recycling" technology exceeds the energy requirements of manufacture from logs by 33 percent(26). However, the data upon which the analyses were made are highly aggregated and the comparisons made by the authors are subject to different interpretations. Indeed, the only "recycling" mill that was studied was the Abitibi de-inking mill for which waste paper supplies only one third of its pulp input. The Office of Energy Conservation of the Department of Energy, Mines and Resources was highly critical of these papers and Langford himself has written what amounts to a guarded retraction of the conclusions presented in his papers(27).*

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* A typical 100 ton/day plant de-inking high grade papers may have to dispose of 4000-5000 lb/day of loose bale wrappers, 600 lb of loose baling wire and strapping, 300 lb of scrap metal, 200 lb of centrifugal cleaner rejects, 2000 lb or more (depending on the volume of material sorted) of sorting rejects, 500 lb of floor sweepings and 3 million gallons of very dirty water.(23)

By contrast, other authorities assert that recycling mills, particularly de-inking mills, have lower energy requirements than virgin fibre mills(28). In a comparison of various pulp making processes, de-inking requires considerably less steam and electrical energy than eleven other primary pulping processes(29).

While it appears that there is an environmental and energy consumption advantage to de-inking over wood pulping, the wastes generated by de-inking are still sufficient to impose environmental damages and must be treated accordingly.

Recycling - The Effects on Paper Product Quality Characteristics

The quality characteristics about which there is most concern are:

1) Strength: recycled fibres are shorter and do not bind together as strongly as do virgin pulp fibres. Consequently, tear, mullen and other strength measures are lower for recycled papers.
2) Cleanliness and Dirt Count: "tramp" contaminants, primarily inks, cause spots or graying. This can be overcome by bleaching, but this involves added equipment and greater costs of production.
3) Hot Melt Adhesives and Waxes: aside from causing manufacturing problems, these materials form slippery, smooth surfaces on the sheet which can break more easily, and which will not accept printing.

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* "With reference to recent papers published by J. Fooks and myself on paper recycling energetics, I would like to emphasize that the conclusions we arrived at should not be applied to paper recycling in general." Personal communication from C. H. Langford.

While contaminants are cited as causing most of the quality changes when paper is recycled, it has been shown that the repulping and cleaning processes themselves are responsible for the loss of strength characteristics of recycled papers(30).

A detailed assessment of the effects of contaminants has been prepared by the Midwest Research Institute(31). These studies indicate that it is technologically feasible to produce all paper products from almost 100 percent recycled fibre with quality characteristics similar to those of their virgin fibre counterparts. Moreover, fine papers made from de-inked stock are less susceptible to curl and shrinkage than are primary fibre papers. However, the achievement of many of the quality characteristics, to which the industry and its customers are currently accustomed, with recycled fibre may involve extra costs. Fine papers, tissues and newsprint containing more post-consumer waste paper may require extra bleaching which is both expensive and polluting. More recycled than virgin fibre must be used in container board to achieve the same strength characteristics.

"Lowering" quality characteristics would permit the inclusion of more waste papers in most paper products. Certainly, where appearance characteristics are most affected, allowing more spots and grayer papers would not adversely affect their usefulness except in certain cases.* Where functional characteristics are involved, changing current levels of recycled content could adversely affect the operation of converting and printing operations. Changes in functional properties would be feasible but would have to more directly involve other sectors in the market system, particularly paper product consumers.

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* Computerized Optical Reading Devices require papers that are free of spots and specks.

REFERENCES: CHAPTER III

1. Canadian Pulp and Paper Association (CPPA), REFERENCE TABLES, 1975 (Montreal: CPPA, 1975).

2. See Rex Lucas, MINE TOWN, MILL TOWN, RAIL TOWN (Toronto: University of Toronto Press, 1971).

3. CPPA, REFERENCE TABLES, 1975, p 13.

4. *Ibid*, p 15.

5. *Ibid*, p 26, 28.

6. PULP AND PAPER CANADA - 1975 BUSINESS DIRECTORY (Westmount, Quebec: National Business Publications Ltd., 1975).

7. Fred L. Smith, Jr., "Waste Paper Recycling: Review of Recent Market Demand and Supply", PULP AND PAPER, September, 1975, p 148-151.

8. John A. Guthrie, THE NEWSPRINT PAPER INDUSTRY - AN ECONOMIC ANALYSIS (Cambridge, Mass: Harvard University Press, 1941).

9. INCOME TAX ACT, Chapter 63, Statutes of Canada, 1970-71-72, Section 65(1)-(3).

10. CPPA, REFERENCE TABLES, 1975, p 12.

11. Thomas Quimby, RECYCLING - AN ALTERNATIVE TO DISPOSAL (Baltimore: Johns Hopkins Press, 1975).

12. M. J. Frost, Canadian Pulp and Paper Association, REPORT ON CONSUMPTION OF RECYCLED AND RECLAIMED FIBRE IN CANADA (Montreal: CPPA, Environmental Services, 1972-73).

13. Kenneth Lowe, "Contaminants Supply Problems Hinder Secondary Fibre Usage", PULP AND PAPER, December, 1973, p 100-104; Midwest Research Institute and Franklin Associates, PAPER RECYCLING - THE IMPACTS OF CONTAMINANTS, 1973-85 (New York: The American Paper Institute, 1975); National Association of Secondary Materials, Inc., A STUDY TO IDENTIFY OPPORTUNITIES FOR INCREASED SOLID WASTE UTILIZATION (Springfield, Va.: National Technical Information Service, U.S. Dept. of Commerce, 1972), p 143-145.

14. Paper Stock Institute of America, PAPER STOCK STANDARDS AND PRACTICES, Circular PS-74 (New York: National Association of Recycling Industries, Inc., 1974).

15. Environment Canada, RECYCLING OF MIXED OFFICE WASTE FROM THE NATIONAL CAPITAL AREA (draft copy) (Ottawa: Solid Waste Management Branch, July, 1975), p 7-10, Appendix F, G, and H.

REFERENCES: CHAPTER III - continued

16. Peter LeBlanc and Richard Harrison, "Fractionation of Secondary Fibres", TAPPI, April, 1975, p 85-87.

17. A. M. Altieri and J. W. Wendell, Jr., DE-INKING OF WASTE PAPER, TAPPI Monograph Series No. 31 (New York: Technical Association of the Pulp and Paper Industry, 1967).

18. Ibid, p 83-85

19. Michael D. Sullivan, "Garden State Paper Co.: Modern Phenomenon", PULP AND PAPER, September, 1971, p 116-119.

20. A. D. Little, Inc., THREATS AND OPPORTUNITIES WITHIN THE NEWSPRINT-NEWSPAPER INDUSTRY: PART IV NEWSPRINT MANUFACTURING TECHNOLOGY AND ECONOMICS (Cambridge, Mass.: Arthur D. Little, Inc., October, 1974), p 135-56.

21. Ibid.

22. Frank R. Hamilton, "Market Pulp from Secondary Fibre", in Paul D. Van Derveer and Kenneth E. Lowe ed. FIBRE CONSERVATION AND UTILIZATION (San Francisco: Miller Freeman Publication, Inc., 1974), p 56-66.

23. A. M. Altieri and J. W. Wendell, Jr., op. cit., 1967, p 74.

24. T. E. Rattray, PAPER RECYCLING IN CANADA (unpublished mimeo) (Ottawa: Environment Canada, Solid Waste Management Division, February, 1974), p 14-17.

25. Ontario Ministry of the Environment, files of the Pollution Control Branch.

26. James R. Fooks and C. H. Langford, "Recycling Paper: An Examination of Scarcity and Conservation from a Thermo-dynamic Perspective", CHEMISTRY IN CANADA, January, 1975, p 16-19; "Paper Recycling Energetics: Some Canadian Experience", ENVIRONMENTAL LETTER, 6 (3), 1974, p 205-210.

27. COMMENTS ON THE STUDY OF PAPER RECYCLING ENERGETICS BY FOOKS AND LANGFORD, by the Department of Energy, Mines and Resources, February, 1975, p 3.

28. Al J. Felton, "Secondary Fibre Technology - 1976", TAPPI, Vol. 58, No. 4, April, 1975, p 83; T. E. Rattray, op. cit., 1974, p 15-16; Kenneth E. Lowe, "Recyclers Claim Environmental Benefits for Secondary Fibres, PULP AND PAPER, January, 1974, p 71.

REFERENCES: CHAPTER III - continued

29. U.S. Environmental Protection Agency, DEVELOPMENT DOCUMENT FOR INTERIM, FINAL, AND PROPOSED EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCES STANDARDS FOR THE BLEACHED KRAFT, GROUND WOOD, SULPHITE, SODA, DEINK, AND NON-INTEGRATED PAPER IN U.S. SEGMENT OF THE PULP, PAPER, AND SCOREBOARD MILLS POINT SOURCE CATEGORY, Volume II, Sections VIII-XV (Washington, D.C.: EPA, Office of Water and Hazardous Materials, January, 1976), p 604.

30. J. W. Koning, Jr. and W. D. Godshall, "Effect of Repeated Recycling of Fibre on Corrugated Container Strength", PAPERBOARD PACKAGING, December, 1975, p 36-40.

31. Midwest Research Institute and Franklin Associates, PAPER RECYCLING - THE IMPACTS OF CONTAMINANTS 1973-85 (New York: American Paper Institute, 1975).

CHAPTER IV

THE STRUCTURE OF THE WASTE PAPER MARKET SYSTEM

WASTE PAPER MARKETS - SOME TERMS AND DEFINITIONS

Since recycling has been popular in recent years, it has joined the ranks of words that are used without precision or even clear meaning. Some working definitions of terms which will be used throughout this report are presented below.

The newspaper collection and depot programmes that various groups and municipalities have undertaken during the past several years have been called recycling programmes. However, many of these programmes have been terminated precisely because the secondary materials were not, in fact, recycled by the consuming industry. In the present context, recycling refers to the complete process of separation, collection, cleaning and finally the utilization of secondary materials in a manufacturing process.

The terms secondary fibres, residuals, waste papers, scrap, and paper stock give rise to further confusion. The use of the word residual in reference to the by-products of production and consumption is more precise than the word waste because a waste in one context may be a good raw material in another. Waste paper refers to the by-products of paper product converting operations or the remains of paper products after they have served their intended uses. Paper stock is the term given to scrap or waste papers that have been sorted and baled into specified grades although paper stock is commonly used interchangeably with the term waste paper.

Post-consumer waste, as distinct from scrap papers from manufacturing or fabricating operations, are those paper products that have served their intended uses as products and are then discarded. Secondary fibre is a general term that is often used to refer to waste papers. However, in the pulp and paper industry, secondary fibres also include sawmill wastes, lumbering wastes, wood chips, saw dust, waste textiles, flax, hemp, straw and a number of other plant fibres. The term secondary fibre will, therefore, be avoided when referring to paper stock or waste papers in this report.

Waste paper or paper stock markets refer in this report to the process of generating, collecting, processing and selling waste papers that result from manufacturing or fabricating processes and consumption activities. Waste papers are distinct from paper mill broke which is the waste that is generated during the manufacture of paper in a mill. This material is usually reprocessed immediately in the mill. Where mills generate and reprocess broke, they can technically claim that all their paper contains recycled fibres. This further emphasizes the need for clear definitions of the terms which refer to recycling.

WASTE PAPER GRADES

The Canadian Pulp and Paper Association has prepared a list of the various kinds of secondary fibres according to their sources. This listing of secondary fibre sources is presented in Table IV-1. The waste paper market discussed in this report refers only to source categories 1, 2, 3, 4, and 5 in Table IV-1.

A wide variety of paper stock grades are recognized by waste paper dealers, brokers and consuming mills. Moreover, the quality of any given grade of paper stock can vary considerably as well. To bring some order to the business, particularly in the United States, a system of paper stock grades has been developed by the National (U.S.) Association of Recycling Industries and is used as a guide for the industry throughout the U.S. and Canada. Forty-six grade definitions are listed in the institute's official publication, Paper Stock Standards and Practices, Circular PS-74.

Paper stock grades are differentiated by the type of fibre (i.e., groundwood, chemical or mixed), the homogeneity of the fibres and the presence of contaminants. Each of the forty-six paper stock grades listed in Circular PS-74 is defined in terms of:

1) an accepted name
2) a description of the "pack" or bale
3) the percentage of allowable contaminants
4) a percentage of allowable groundwood and filler content.

TABLE IV-1

SOURCES OF RECYCLED OR RECLAIMED FIBRES USED IN THE CANADIAN PULP AND PAPER INDUSTRY

1. Dry paper and paperboard waste generated after completion of the paper making process: the paper making process is defined as those manufacturing operations up to and including the trimming and cutting of the paper machine reel into smaller rolls or rough sheets.

2. Finished paper and paperboard products from obsolete inventories of manufacturers, merchants, wholesalers, dealers, printers, converters.

3. (a) paper and paperboard waste, printed or not, resulting from printing, cutting, forming and other converting operations, including over-issues.

   (b) butt rolls, mill wrappers and rejected unused stock.

4. Paper, paperboard and fibrous wastes from factories, retail stores, office buildings, homes, etc., after they have passed through their end usage as a consumer item, including:

   (a) used corrugated boxes and paperboard boxes,
   (b) old newspapers,
   (c) old magazines,
   (d) business papers,
   (e) tabulating cards, and
   (f) mixed waste.

5. All paper, paperboard and fibrous wastes reclaimed from municipal solid waste.

6. Fibrous wastes produced during wood harvesting, manufacturing, extractive or cutting processes:

   (a) sawmill slabs and chips,
   (b) sawdust and shavings,
   (c) unbarked forest residues (e.g. tops, branches, etc.).

7. Other fibrous wastes:

   (a) linters, and agricultural residues,
   (b) textile wastes and cuttings, rope and rope waste, etc.

SOURCE: Canadian Pulp and Paper Association, Technical Section, DATA SHEET Z-26, August, 1972.

Contamination is a critical determinant to the quality grading and price of the "pack" or bale of paper stock.

Paper stock grades may be aggregated into five major classifications:

1) Bulk Grades
    a) Mixed Paper: mixtures of various types of papers not limited to the kind of packing or fibre content,
    b) Newsprint: this includes used newspapers, overissue papers (those not sold and returned to the publisher) and press-room broke,
    c) Corrugated or Container Grades: new and old corrugated containers and clippings from converting operations.
2) Premium Grades
    a) De-inking Grades: papers consisting primarily of sulphite or kraft fibres which have been dyed or printed. The dyes and the ink must be removed by cooking, washing and bleaching to obtain a high-quality pulp for making fine papers. This grade does not include newsprint which can also be de-inked.
    b) Pulp Substitutes: papers which are generated in clean homogeneous lots or packs and which have little or no printing. These grades may be substituted directly for virgin pulp in some paper furnishes. (While de-inking newsprint is not included

here, white unprinted sheets of newspaper are classified as pulp substitutes as well.)

In order to compile statistical data, each of the forty-six grade definitions from Circular PS-74 is assigned to one of the above aggregate catagories. These assignments are shown in Table IV-2 and they are intended to be consistent with previous studies of waste paper markets. The grades most commonly traded in Ontario are indicated in Appendix A.

It is not immediately clear from the names of the paper stock grades which are post-consumer wastes and which are fabricating scrap.* Some examples of the representative paper stock grades which are post-consumer wastes are presented below.

Major Paper Stock Category	Post-consumer Waste Paper Stock Grades
1. Mixed papers	#1 mixed papers
2. News	Used newspapers
3. Container grades	Used corrugated boxes
4. De-inking grades	Advertising flyers, graded magazines
5. Pulp substitutes	Computer tabulating cards

CHARACTERISTICS OF RECYCLABLE MATERIALS

The characteristics of any substance considered as a raw material input - whether it be iron ore, glass, pulp wood or waste paper - are:

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* Post-consumer waste papers include source groups 4 and 5 in Table IV-1.

TABLE IV-2

PAPER STOCK GRADES

Common Names	Circular PS-74 Names	Circular PS-74 Numbers
Bulk Grades		
Mixed Paper	#2 Mixed paper	1
	#1 Mixed paper	2
	Super-mixed paper	3
	Boxboard cuttings	4
	Mill wrappers	5
News Grades		
- used newspapers	#1 news	6
	Super news	7
	Special news de-ink quality	8
	Over-issue news	9
Container Grades		
- old corrugated boxes	Solid fibre containers	10
	Corrugated containers	11
- corrugated cuttings	New corrugated cuttings	12
	New double kraft-lined corrugated cuttings	13
	New kraft corrugated cuttings	14
Premium Grades		
Pulp Substitutes		
- used brown kraft	#1 used brown kraft bags	15
	Mixed kraft bags	16
	Sorted brown kraft	17
	New coloured kraft	18
- new brown kraft	New brown kraft cuttings	19
	New brown kraft bag waste	20
	New brown kraft envelope cuttings	21
	Mixed shavings	22
- groundwood shavings	#1 groundwood shavings	23
	White newsblanks	24
	Super-white newsblanks	25
	Publication blanks	26
	#1 flyleaf shavings	27
	Soft-white shavings	28

..... continued

TABLE IV-2 continued

Common Names	Circular PS-74 Names	Circular PS-74 Numbers
	Supersoft-white shavings	29
	Hard-white shavings	30
- white envelope cuts	Hard-white envelope cuttings	31
	Superhard-white envelope cuttings	32
- coloured envelope cuts	New coloured envelope cuttings	33
	Semi-bleached envelope cuttings	34
	Super semi-bleached envelope cuttings	35
- coloured tab cards	Coloured tabulating cards	36
	Manila tabulating	37
	Unprinted bleached sulphate	46
De-inking Grades		
- coloured ledger	#1 sorted coloured ledger	38
	Manifold coloured ledger	39
- white ledger	#1 sorted white ledger	40
	Manifold white ledger	41
- old magazines	#1 graded magazines	42
	#1 book stock	43
	Printed bleached sulphate cuttings	44
	Misprint bleached sulphate	45
- computer paper		
Specialty Grades		

SOURCE: Paper Stock Institute of America, Paper Stock Standards and Practices, Circular PS-74.

1) Mass
2) Level of contamination
3) Homogeneity
4) Location

A material is more economical to handle and transport if it has greater mass. Thus, a residual material must be aggregated to achieve sufficient mass for it to be economically handled and recycled. Four thousand copies of a newspaper, each weighing a half pound and sitting in different households have no value. However, two thousand of these papers tied together in a clean, transportable, storable bale can have a specific dollar value to a paper mill. The ability to accumulate a high mass is a critical factor in determining whether materials of relatively low value should be reclaimed or discarded.

The level of contamination refers to the extent to which the desired material occurs in combination with other materials and the difficulties involved in separating them. Contamination may result from a production process such as the lining of milk cartons with plastics. Contamination may also occur when residuals not impervious to other materials are mixed for handling as in the collection of municipal solid wastes. The possibility of recycling paper residuals after they have been mixed with household or commercial refuse may be reduced because of the difficulty of separating paper from the grease and dirt in the flux of mixed solid residuals. If the contamination or adulteration of materials is specific, known, and limited to one type, the possibility of recycling is increased because specific operations for processing the residuals can be applied.

For example, the plastic coating on milk-carton board can be separated from the paper by a process specifically designed for this function.

Homogeneity has an obvious bearing on the recyclability of residuals in terms of the case of processing and of the quality of output. The greater the homogeneity of the residual, the greater the potential for recycling.

Location is significant from two different aspects. First, location can refer to residuals-generating sites, which may be widely dispersed. Many secondary materials are generated in small quantities from many sites. A recyclable mass must be developed by transporting the dispersed residuals to a central point. Location in this sense refers to the dispersion of residuals and implies a degree of effort to accumulate them into a recyclable mass. The second way in which location is a significant characteristic is the distance of the generation area or central collection point from the manufacturing plants equipped to utilize the secondary material. It is in this second sense, in particular, that location is considered the fourth characteristic in determining recyclability.

Each of these four primary characteristics - mass, contamination, homogeneity, and location - vary with different types and sources of waste papers. The recyclability of the different waste paper grades varies directly with these characteristics.

THE WASTE PAPER MARKET SYSTEM

The waste paper or paper stock market may be viewed as a system which contains five primary functional components. These components are:

1) Waste paper generators,
2) Paper stock suppliers (dealers and brokers),
3) Paper stock consumers (paper mills),
4) Consumers of paper products, and
5) Transportation links between the other components.

This system is illustrated in Figure IV-1. Manufacturing plants, printing shops, corrugated box manufacturers, stores and individuals generate various quantities and qualities of scrap and waste paper. Dealers and brokers locate sources of waste paper. Dealers may sort and bale it to make a product, paper stock, which the mills will accept. Brokers usually arrange to ship waste paper directly from generators to paper mills and depend on the generator to maintain a quality acceptable to the paper mill. Paper mills, in turn, make hundreds of different kinds of paper products which are sent to customers. Paper product customers and generators are often one and the same.

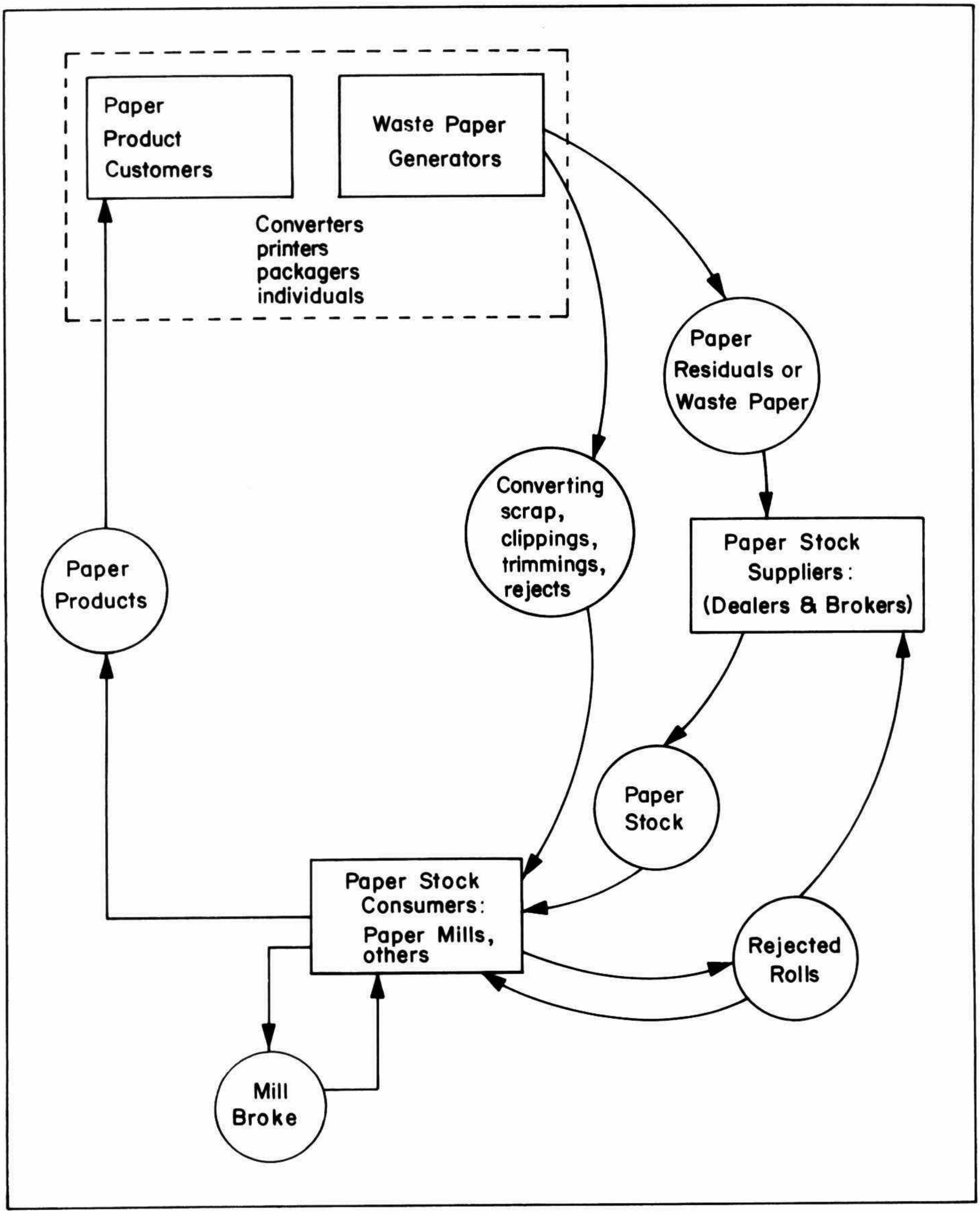
Because there are no tariffs on waste paper, there is a free flow of this commodity between Canada and the U.S. as well as among the cities of eastern Canada. The focus of the "Ontario Waste Paper Market" is the Toronto-Niagara Peninsula-Buffalo, N.Y. area.

The salient features of each of the system components will be discussed in the remaining sections of this chapter.

WASTE PAPER GENERATORS AND CONSUMERS OF PAPER PRODUCTS

Virtually all members of society generate waste paper in one form or another. Because they are so fundamentally related, both waste paper generation and paper product consumption are considered

FIGURE IV-I
WASTE PAPER MARKET SYSTEM


Paper Product Customers
Waste Paper Generators
Converters
printers
packagers
individuals
Paper Residuals or Waste Paper
Converting scrap, clippings, trimmings, rejects
Paper Stock Suppliers: (Dealers & Brokers)
Paper Products
Paper Stock
Paper Stock Consumers: Paper Mills, others
Rejected Rolls
Mill Broke

together in this section.

Waste paper generation, regardless of the source, has the following characteristics. First, waste paper, like other wastes, is a by-product of some other product or activity so that the quantity and quality of the wastes are dependent on the primary product or activity. Thought is seldom given to modifications or efforts that would improve the recyclability of the wastes. Second, the generator's chief concern is to dispose of his wastes with as little cost or effort to himself as possible. The generator, therefore, will view recovery of wastes for recycling as one alternative method of waste disposal. If he is aware of the costs associated with the various waste disposal alternatives, the generator will choose whichever is cheaper.

Whether waste papers are discarded or recycled, generators must accomplish some or all of the following functions: on-site handling, processing (i.e. sorting, crushing with one's foot, shredding, etc.), storage, collection and transporting the residuals and costs are usually associated with each of these functions. For firms, these costs can be measured in terms of wages and equipment; for individuals, it usually means some degree of inconvenience or extra time. The costs of recovery are often (but not always) higher than the costs of discard because extra handling, processing, storage and collection are necessary to keep the waste papers for recycling separate and free of contaminants.

Where firms are aware of their costs of waste disposal as opposed to materials recovery, they can and do determine whether discard or materials recovery for recycling is the most profitable (or least cost) method of solid waste disposal. On the other hand, most households as well as many offices and commercial establishments are not fully aware of the actual costs and the potential benefits of materials recovery. Moreover, solid waste collection systems are designed for the maximum efficient collection of mixed wastes. These systems make disposal cheap and convenient to waste generators. Thus, there is no clear incentive for generators to reduce wastes or to incur the cost and bother of separating for recycling.

Density and storage are especially critical to the relative costs of discard and materials recovery. Where on-site densification is required for final disposal, then the costs of recovery may only be marginally more expensive. For example, corrugated boxes are bulky and must be compacted for disposal as well as recovery. Furthermore, the disposal of newspapers usually involves accumulating them in a separate, relatively dense pile. Recovery merely involves collection and transport to a mill rather than a dump site. Finally, inadequate storage facilities have been cited by paper stock dealers as a prime reason why waste papers are not recovered from many potential sources, particularly offices and apartment buildings. There is simply no place to store the separated paper residuals until they can be collected.

Broadly speaking, there are two basic types of paper product consumers:

1) industrial users who utilize paper as a raw material to make new paper products or as packaging to convey products to final consumers,
2) consumption users who utilize paper products just prior to final disposal.

Industrial users include printers and paper converters, manufacturing establishments, paper mills and some retail stores. Consumption users consist of household, offices, universities and government.

Industrial-type users generally consume large quantities of paper products and generate waste papers in large, uniform amounts which are relatively free of contamination. On the other hand, consumption-type users consume various types of paper products in both large and small quantities. Wastes tend to be in smaller, dispersed amounts with various kinds of papers mixed with various kinds of contaminants.

The ten primary waste paper generator sectors are listed in Table IV-3.

The grades of paper stock now being recovered from each sector are noted by an "r" in Table IV-3. A "p" indicates that waste paper is available so that recovery could be initiated or increased, although it may not necessarily be economical for dealers to do so. The most promising potential sources of premium grades of waste paper are institutions (universities, etc.) office buildings and government facilities. These also constitute the primary potential sources of bulk grades of waste paper. At present, there is no systematic or co-ordinated effort to recover waste paper from offices and other facilities of the provincial government.*

It is apparent from Table IV-3 that the current sources of premium grade waste papers are printers, industrial plants, paper mills and some retail establishments. Wastes from these generators

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* Dealers do tap these sources to a certain extent during periods of high waste paper demand.

TABLE IV-3

POTENTIALLY RECOVERABLE ORIGINS OF WASTE PAPER

Generators	Mixed	News	Corrugated	De-inking	Pulp Substitutes
Residential		p			
Institutional	p	r		p	p
Office Buildings	p	p		p	
Government	p	p		p	p
Retail	r		p		
Wholesale	r	r		r	r
Transportation	p	p			
Printers		r		r	r
Converters			r	r	r
Utilities	r			r	r
Industrial	r		r		r
Paper Mills				r	r

p - potential for new or increased recovery
r - currently recovered

are particularly desirable because the materials are produced in large, homogeneous and contaminant-free quantities. A survey of waste paper generators revealed that virtually all of these waste papers which are economical for dealers to obtain from these sources are being recovered. Although dealers are constantly on the lookout for new sources of clean, premium waste papers, additional supplies could be developed by dealers only at higher costs of sorting mixed office wastes or collecting smaller quantities of presorted papers from additional generators.

PAPER STOCK DEALERS AND BROKERS

The firms which locate, collect, sort and sell waste paper to consumer mills may be classified into three basic types:

1) part-time peddlers who enter and leave the market as prices rise and fall,
2) small, full-time dealers who handle paper as a sideline,
3) larger paper stock dealers and brokers which deal exclusively in paper stock.

Public service organizations such as the Boy Scouts, The Salvation Army, churches and schools are also an important means of assembling paper, principally newspapers, for recycling via dealers or brokers.

Paper stock dealers differ from brokers primarily in that dealers physically receive the paper stock, sort it, bale it, and then ship it to consuming mills. Brokers rarely handle the material themselves, but arrange to have the waste papers separated and baled by the generator who ships it directly to the consuming mills. In addition, some paper stock-using mills buy material directly from generators.

There are at least 18 full-time waste paper dealers and brokers in the Metropolitan Toronto area, about 11 in Ottawa, and at least 8 more located in other cities in the Province. A list of these dealers is presented in Appendix B. The number of part-time peddlers or scrap dealers who handle paper is not known.

Despite the apparent numbers of firms in this sector, five companies actually dominate the field in terms of the amounts of paper stock that are traded. These firms are:

1) CONSOLIDATED FIBRES (of which Canadian Paper Fibres and Paper Fibres of Canada are subsidiaries),
2) ELLIOT KREVER ASSOCIATES (a broker),
3) BENEDETTO GROUP (of which Toronto Paper Fibres Ltd., Mill Paper Fibres Ltd., and Levis Paper Fibres Ltd. are subsidiaries),
4) BUSCOMBE AND DODDS LTD.,
5) REED PAPER LTD.

Relationships among mills, dealers and generators appear to be established on a somewhat informal basis. Dealers and generators and generators and mills have contracts with each other but, because of the cyclical nature of the business, it is understood that these contracts are seldom strictly enforced. If a mill closes down, it is generally under no obligation to take any material and dealers do not press the point.

Because of the competition among dealers for premium grades, dealers will usually continue to take pulp substitutes, de-inking grades and even clean quantities of corrugated even when demand is off and prices are low. On the other hand, supplies of available bulk grades are often in excess of demand. Dealers are thus able and obliged to turn on and off supplies of these grades when demand changes. They are able to do this by having periodic newspaper drives with volunteer labour. Mixed office waste and old corrugated boxes may be obtained from generators who otherwise discard the material.

Sorting and handling by dealers is extremely labor intensive, with all sorting now being done by hand. The only mechanization that has occurred in this sector has been the installation of high-density balers. Consequently, the steady rise in labour costs over the past twenty years has made sorting so expensive that only high value premium papers are generally sorted. Corrugated and waste news may be examined for contaminants but these grades are not sorted to the same extent as ledger or tab card grades.

Three additional factors constrain the ability of the dealer-broker sector to recover and direct more high grade waste papers into the recycling market system. First, there is the increasing degree to which papers are contaminated, intentionally and unintentionally, with materials that are incompatible with recovery and recycling. This trend is due to the tendency of manufacturers to combine such materials as aluminum and plastics with paper. It is also a consequence of the increasing expense of handling waste materials. The most obviously efficient method of handling wastes is to dump them all together thus contaminating recyclable waste paper. The trend toward increasing contamination of waste paper is regularly lamented in the literature(1, 2, 3).

A second problem which affects dealer operations is that there is no commercially available device or system that will automatically remove contaminants or sort different grades of paper stock. This is due, in part, to the third major problem facing the dealer-broker sector. Demand and prices of many grades of paper stock, especially bulk grades, are volatile and unpredictable. Consequently, dealers and brokers often lack the stable profits which attract investment and allow innovation.

As a result of these trends, dealers are recovering less and less waste paper which does not come from large generators. Only large increases in prices and consumption would induce dealers to sort more mixed or contaminated papers or collect from smaller generators.

Despite the apparent dominance of the waste paper market by the five established, Toronto-based firms, the dealer sector of the market is highly competitive. This is due, in part, to the traditionally individualized, entrepreneurial nature of the business and, perhaps in a greater part, to the ease of entry and exit from the market for new firms. When demand and prices climb, new firms and the part-time peddlers quickly begin collecting waste paper. The company which was high bidder for the waste newspaper being collected by Metro, Ca-Chem Ltd., had been formed only a few months prior to their bid in February, 1974. At least two new dealerships were started in the Ottawa area in 1974 in response to the lure of high prices and apparently high profits. Consequently, paper dealers cannot and do not hold the prices they pay to generators below the "market value" for very long. In times of rising demand, dealers must bid up the prices they pay to generators in order to maintain their suppliers.

Competition among dealers and brokers for customers of their material is less obvious but no less real. The service which a dealer provides to a mill and the quality of the paper stock delivered are two other competitive factors, apart from price, which determines who gets orders and business.

PAPER MILLS

There are 19 paper mills in Ontario which use waste papers. At least three other mills in Quebec use paper stock which is generated in Eastern Ontario. Sixteen other pulp and paper mills in Ontario do not use paper stock on a regular basis. Paper stock consuming mills are summarized in Table IV-4 while those mills dependent on virgin wood fibre are listed in Table IV-5. These tables show the distinct split between small, paper stock using mills in the south and the larger, integrated wood pulp and newsprint mills in the north.

Paper mills which do use waste paper vary considerably in their requirements for paper stock and their ability to substitute different grades of paper stock with primary wood pulp. They also vary widely in their tolerance to contaminants. Roofing and building board mills can utilize a wide variety of papers with fairly high contaminant levels, while the Abitibi de-inking mill at Thorold and the Kimberly-Clark tissue mill in St. Catharines require exceedingly clean and high quality papers for their particular products. Mills do little or no sorting and will reject bales of waste paper which do not meet their quality specifications. When bales are rejected, a

TABLE IV-4

PRODUCTION AND PAPER STOCK CONSUMPTION OF MILLS IN ONTARIO WHICH UTILIZE PAPER STOCK

Product Type	Product Output ton / year	Paper Stock Consumption 1973 - 1974 ton / year	Utilization Ratio (%)
1. Boxboard:			
Continental Can, Toronto	80 000	80 000	
Strathcona Paperboard	42 000	30 900	
Trent Valley, Glen Miller	45 500	33 060	
Sunoco, Brantford	28 000	25 776	
TOTAL:	195 500	169 736	87
2. Container Board:			
Atlantic Packaging, Scarborough			
- corrugating medium	18 338		
- liner board	31 662		
TOTAL:	50 000	50 000	
Reed (Acme), Toronto			
- jute and chip liner	16 000		
- corrugating medium	9 000		
TOTAL:	25 000	28 000	
Domtar Packaging, Trenton			
- corrugating medium	60 200	18 050	
CONTAINER BOARD TOTAL:	135 200	96 050	71

..... continued

TABLE IV-4 continued

Product Type	Product Output ton / year	Paper Stock Consumption 1973 - 1974 ton / year	Utilization Ratio
3. Tissue:			
Kimberly Clark, St. Catharines	35 000	15 400	
Kimberly Clark, Huntsville	35 000	14 400	
TOTAL:	70 000	19 800	28
4. Construction Materials:			
Canadian Johns Manville, North Bay	51 000	2 200	
Domtar Construction Materials, Cornwall	28 800	8 000	
Domtar Construction Materials, Thorold	25 000	12 000	
IKO, Brampton	21 000	13 000	
Beaver Wood Fibre, Thorold	78 250	87 000	
TOTAL:	204 050	122 200	60
5. Fine Papers:			
Abitibi Provincial, Thorold	90 000	31 500	
Domtar Fine Paper, St. Catharines	50 000	2 532	
Domtar Fine Papers, Cornwall	200 000	500	
TOTAL:	340 000	34 500	10
6. Newsprint:			
Ontario Paper Co., Thorold	240 000	10 000	

..... continued

TABLE IV-4 continued

Product Type	Product Output ton / year	Paper Stock Consumption 1973 - 1974 ton / year	Utilization Ratio
7. Molded Food Trays:			
Diamond National, Brampton	6 800	5 000	
GRAND TOTAL:	1 191 550	457 285	38

SOURCE: Product Output: Pulp and Paper Canada - 1975; Business Directory (Westmount, P.Q.: National Business Publications Ltd., 1975).

Paper Stock Consumption: Personal communication with mills and various published sources.

TABLE IV-5

PULP AND PAPER MILLS IN ONTARIO WHICH DO NOT USE PAPER STOCK, BY PRODUCT TYPE

Product Type	Ton/day	1973 - 74 Capacity Ton/year*
1. Container Board		
Abitibi, Sturgeon Falls		
- NSSC (sulphite pulp)	225	78 750
- Corrugating medium	220	77 000
- Hardboard	160	56 000
Domtar Construction, Red Rock		
- Kraft linerboard	555	194 250
- Newsprint	200	70 000
Total linerboard and corrugating medium only:		271 250
2. Tissues		
Dominion Cellulose (CIP), Toronto		
- Facial and toilet tissue	175	61 250
Kimberly-Clark, Kapuskasing	75	26 250
Total:		87 500
3. Newsprint		
Abitibi, Sault Ste. Marie	345	120 750
Abitibi, Iroquois Falls	935	327 250
- wrapper	45	15 750
Abitibi, Thunder Bay (Mission Point)	375	131 250
Abitibi, Thunder Bay (Bare Point)	460	161 000
Domtar, Red Rock		
- kraft linerboard	555	194 250
- newsprint	200	70 000
Kimberly-Clark, Spruce Falls	1 000	350 000
Great Lakes, Thunder Bay	1 200	420 000
Ontario Minnesota, Kenora	740	259 000
Ontario Paper, Thorold**	710	248 500
Ontario Minnesota, Fort Frances	500	175 000

..... 2/

TABLE IV-5 continued

Product Type	1973 - 74 Capacity Ton/day	Ton/year*
Beaver Wood Fibre, Thorold***		
- newsprint	120	42 000
- paper board	190	66 500
Total newsprint only:		2 304 750
4. Fine Papers		
Abitibi Forest Products, Thunder Bay		
- fine papers	250	87 500
E. B. Eddy, Espanola		
- kraft pulp	625	218 750
- fine and coated papers	150	52 500
Dryden Paper (Reed), Dryden		
- fine papers	200	70 000
Total fine papers only:		210 000
GRAND TOTAL:		2 843 500****

* Based on a 350 day operating year.

** Ontario Paper Co. uses only a small amount of waste newspapers. It is considered a virgin fibre mill by the industry.

*** Beaver Wood Fibre uses only virgin fibre to make newsprint. This pulp is purchased from Ontario Paper Co.

**** Grand Total consists of Sector Totals only.

SOURCE: Pulp and Paper Canada: 1975 Business Directory (Westmount, Quebec: National Business Publications Ltd., 1975) mill has the right to return the paper to the dealer. In practice, Ontario mills seldom send contaminated packs back to dealers. They will simply not buy any additional paper from these suppliers.

Most paper stock using mills obtain 80 to 90 percent of their supplies from dealers and brokers. A few mills, like Atlantic Packaging in Scarborough and IKO in Brampton, have organized their own collection systems to obtain waste paper directly from generators. Mills prefer dealers because they (dealers) deliver paper stock in a form and quality desired by consumer mills. Moreover, mills generally want to avoid getting involved in sorting or handling unbaled material.

TRANSPORTATION

In 1971, about 75 percent of the paper stock used in Canada was transported by truck while the remainder was shipped by rail(4). Little or no waste paper is shipped by water within Canada or even between Canada and the U.S. Transportation costs are customarily paid for or provided by the purchasers of paper stock.

The issue of transportation rate discrimination against secondary and in favour of primary materials is currently being debated both here and in the U.S. Secondary materials dealers and their representative associations allege that higher per unit rates are charged by railroads and trucking agencies for secondary materials (scrap metal and waste paper) than for virgin materials (ores, pulpwood, logs, etc.).

In economic terminology, discrimination exists when a seller sells an identical product to different buyers for different prices. When production or service costs vary, the identification of discrimination is more complicated. In this situation, discrimination exists when the prices which a seller charges result in different price-to-incremental cost ratios. The marginal or incremental cost data required to perform this test of price discrimination were unavailable for this study. However, the question of rate discrimination here in Canada was investigated carefully with the information available.

In the first place, the "class rates" for waste paper, pulpwood and wood pulp charged by railroads in Canada are identical. "Class rates" are established by the railroads with government approval for all classes of commodities. Some of these rates are shown in Table IV-6. Carriers may also enter into agreements with shippers for substantially lower rates if commodities are shipped frequently and in large volumes. It is likely that pulp and paper companies which regularly ship pulp wood (round logs) and wood pulp (in dried sheets) from their mills would be able to avail themselves of these substantially lower negotiated rates.

Lower rates for waste paper could be negotiated if the mill or dealer shipped large quantities of paper stock to the same locations at frequent intervals. However, an analysis of freight movement data supplied by CN Rail revealed that all but a very few of the shipments of waste paper were too small and/or infrequent to warrant negotiated rates with CN. Some mills are able to make favourable transportation arrangements. For example, a mill in Thorold pays $3.50 per ton to ship paper stock from Toronto by truck and $8.50 per ton from a much closer Buffalo. A trucking company gives the lower rate from Toronto in order to obtain tonnage for a

TABLE IV-6

RAIL FREIGHT RATES - C.P. RAIL

CLASS RATES - $ per ton

	Waste Paper		Wood Pulp	Pulp Wood
Toronto to:		From:		
Thunder Bay	61.00	Thunder Bay	61.00	61.00
North Bay	27.00	North Bay	27.00	27.00
Cornwall	30.00	Cornwall	30.00	30.00
Trenton	21.40	Trenton	21.40	21.40
Montreal	34.42	Montreal	34.42	34.42
		To Toronto.		

SOURCE: Car-load Freight Division - C.P. Rail, Toronto, Ontario.

backhaul to St. Catharines.

Transportation costs do not appear to be a serious impediment to the search for paper stock supplies by mills. Paper companies who have been investigating expansion of their facilities for paper stock utilization have looked as far away as Detroit and Montreal for supplies of premium grades of paper stock. A mill in North Bay ships waste news from Toronto paper stock dealers on a regular basis. A mill in Thunder Bay reported that it purchased pulp substitute grade paper stock from as far away as Georgia.

While transportation costs do not appear to be a major impediment to the increased utilization of waste paper at this time, the Canadian Association of Recycling Industries (CARI) does regard transportation rates as a significant problem for its members. CARI is currently studying the situation and it is hoped that they will communicate their findings as soon as they are available.

REFERENCES: CHAPTER IV

1. National Association of Secondary Materials Industries, Inc., A STUDY TO IDENTIFY OPPORTUNITIES FOR INCREASED SOLID WASTE UTILIZATION, Vol. VIII and IX (National Technical Information Service, 1972), p 106.

2. Kenneth E. Lower, Contaminants Supply Problems Hinder Secondary Fibre Usage", PULP AND PAPER, December, 1973, p 100-104.

3. William E. Franklin and Robert G. Hunt, PAPER RECYCLING - THE IMPACTS OF CONTAMINANTS 1973-85 (New York: American Paper Institute, October, 1975), p 74-75.

4. G. H. Manning and M.S. Conway, CONSUMPTION OF PAPER STOCK IN CANADA, 1971, Information Report E-X-21 (Ottawa: Forest Economics Research Institute, Environment Canada, May, 1973), p 7.

CHAPTER V

QUANTITATIVE DIMENSIONS OF THE WASTE PAPER MARKET

POTENTIAL WASTE PAPER SUPPLIES

The amount of waste paper that is potentially recoverable for recycling is dependent on, but somewhat less than, the quantity of paper products consumed and discarded. The quantity of potentially recoverable waste paper generated in Ontario over a given time period is, therefore, equal to:

a) the quantity of paper products produced in Ontario;

less,

b) the quantity of paper exported from Ontario as products or packaging;

plus,

c) the quantity of paper brought into the province as products or packaging;

less,

d) sanitary tissues discarded into sewers;

less,

e) paper products stored as books, files, magazines, etc.;

less,

f) papers incorporated into buildings (when buildings are demolished, these papers are not recovered);

less,

g) those papers which are contaminated during fabrication or use (but not during discard).

"Potentially recoverable" waste paper refers to that which is physically available for recovery and this constitutes the potential supply of paper stock. The amounts actually recovered depend on the costs of recovery relative to the price paid for the particular grade of waste paper and reflect the demand for the grades in question.

The data necessary to determine the actual quantities of each grade of waste paper that are discarded and are potentially recoverable do not exist for Ontario. However, there are two approaches that can be used to estimate the potentially recoverable waste paper. The first is to begin with the amount of paper products manufactured. It must be assumed that all paper products produced in the province or the nation will become solid wastes except those which are exported, flushed down toilets or stored as books, records, files, etc. Out of a total Canadian production of paper and paperboard of 14.3 million tons in 1973, Middleton _et al_ have estimated that 4.2 million tons were potentially recoverable(1). This estimate did not take account of the paper and paperboard entering and leaving Canada as packages and boxes.

Similar adjustments have to be made to Ontario production figures for 1972, the latest year for which Ontario data are available. The amounts of paper and paperboard products produced in Canada, Ontario and Quebec during 1972 are shown in Table V-1. The following adjustments were made to these data.

1) Approximately 2.3 percent of the fine papers and paperboards are delayed in use and so are subtracted from the production figures(2).

2) All tissues are assumed to be non-recoverable. They are either discarded into sewers or are too heavily contaminated to repulp.

3) All building papers are assumed to be non-recoverable. They are incorporated into buildings. When the buildings are demolished, any paper is discarded as demolition waste.

4) Eighty percent of the newsprint made in Ontario is exported(3). Of the remaining 20 percent, all is assumed to be potentially recoverable.

5) Approximately 304 700 tons of post-consumer waste paper was consumed by the pulp and paper industry in Ontario. Of this, about 43 000 tons of waste paper were a net import into Ontario.* Hence, 261 700 tons are subtracted from the total adjusted in Table V-1.

Again, there are no data on the inter-provincial transfers of paper either as products or packaging. The resulting 1 385 400 tons of potentially recoverable waste paper generated in 1972 is likely to be a low estimate because there is a significant, but unknown, quantity of paper and board brought into this province and discarded here.

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* Provincial data on imports and exports of waste paper supplied by External Trade Division of Statistics Canada.

TABLE V-1

INPUT ANALYSIS OF THE POTENTIALLY RECOVERABLE WASTE PAPER GENERATED IN ONTARIO, 1972

(000 ton)

Product	Canada(1) 1972	Canada(1) 1973	Quebec(2) 1972	Ontario(2) 1972	Adjustments	Estimated Quantity of Potentially Recoverable Waste Paper	
Fine Paper	971	1 076	323.8	561.7	(-12.9)(3)	548.8	
Paperboard totals *	2 140	2 045	877.4	687.8	(-15.8)(3)	672.0	
Linerboard	925	1 151					
Corrugating medium	457	488					
Boxboard	758	766					
Building papers and boards	503	531					
Other	182	182	234.8**	127.1**	100 percent not recoverable		
Tissue	312	337					
Coarse kraft wrapping	497	652	240.1	68.2	100 percent recoverable	68.2	
Newsprint	8 820	9 140	4 180.6	1 790.5	80 percent exported 100 percent of remaining recoverable	358.1	
TOTAL:	13 425	14 323	5 865.7	3 235.3		1 647.1	
						+ 43.0	net imported paper stock
						- 304.7	post-consumer waste recycled in Ontario
ADJUSTED TOTAL:						1 385.4	TOTAL

SOURCES: (1) Canadian Pulp and Paper Association, Reference Tables, 1974.
(2) Statistics Canada, Pulp and Paper Mills, Catalogue 36-204.
(3) An estimated 2.3 percent delayed in use (see text).

* Totals include linerboard, corrugating medium and boxboard.

** Totals include building papers and boards, "other" and tissues.

A second method of estimating the potential supply of waste paper is through the use of per-capita paper consumption figures published by the Canadian Pulp and Paper Association. Based on these data, estimates of the total consumption of paper product for 1973 is presented in Table V-2. After the appropriate adjustments are made (see footnotes in Table V-2), the total amount of potentially recoverable paper generated in Ontario is estimated to be about 1.5 million tons. This corroborates the estimate of 1.385 million tons developed in Table V-1.

Of this 1.5 million tons, the calculations in Table V-2 indicate that between 700 000 and 800 000 tons of usable paper are generated in the Toronto region.* Again, these estimates are probably low because the per-capita consumption for Ontario is likely to be higher than for Canada as a whole and higher still for Toronto because of the high level of economic activity occuring in these areas.

Ontario citizens may, therefore, be presumed to discard about 1.5 million tons of waste paper and paperboard in one year which are potentially recoverable. Of this, at least 700 000 tons are generated in and around Toronto.

Because of the public interest and activity in newspaper recycling and because of the particular ease with which newspapers may be separated for recovery and recycling, newspaper generation in Toronto and Southern Ontario is examined

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* The Toronto Region includes the Metropolitan area and the counties of York, Peel, Halton, Wentworth, Niagara and Durham.

TABLE V-2

ESTIMATED PAPER AND PAPERBOARD CONSUMPTION IN ONTARIO, 1973

	ONTARIO					TORONTO REGION	
PRODUCTS	Per-Capita Consumption lb / person per year 1973 (1)	Ontario Population 1973 (2) (persons)	Total Consumption of Paper Products (tons)	Total Potential Recoverable Waste Paper (3) (tons)	Toronto Region, Oshawa and St. Catharines Population 1973 (4) (persons)	Total Consumption of Paper Products (tons)	Total Recoverable Waste Paper (3) (tons)
Newsprint	77.7	7 988 000	310 334	310 334	3,629,551	141 008	141 008
Printing and Writing (fine papers)	72.3	"	288 760	288 766	"	131 208	131 208
Wrapping	35.2	"	140 589	140 589	"	63 880	63 880
Tissues & Sanitary Papers	29.9	"	119 421	0	"	54 262	0
Container Board	111.8	"	446 529	446 529	"	202 892	202 892
Corrugating Medium	33.4	"	133 400	133 400	"	60 614	60 614
Liner Board	78.3	"	312 730	312 730	"	142 094	142 094
Boxboard	78.7	"	314 328	314 328	"	142 823	142 823

See footnotes at end of Table

Continued...

Table V-2 continued

PRODUCTS	Per-Capita Consumption per person per year 1973 (1)	Ontario Population 1973 (2) (persons)	Total Consumption of Paper Products (tons)	Total Potential Recoverable Waste Paper (3) (tons)	Toronto Region, Oshawa and St. Catharines Population 1973 (4) (persons)	Total Consumption of Paper Products (tons)	Total Recoverable Waste Paper (3) (tons)
Building Papers	46.4	"	185 322	9 266	"	84 206	4 210
TOTAL		"	2 251 413	1 955 942	"	1 022 987	888 729
Per-Capita Consumptions of all Grades	454	7 988 000	1 813 276	1 509 812	3 629 551	823 908	685 349

(1) SOURCE: CPPA, Reference Tables, 1974, P. 31.

(2) SOURCE: Stastics Canada, Cat. 91,001 Quarterly.

(3) Adjustments: Newsprint, Fine Papers, Wrapping, corrugated and boxboard all assumed to be 100% recoverable; Tissue and sanitary Papers assumed to be 100% non-recoverable; Building papers, assume 95% non-recoverable.

Continued...

Table V-2 continued

(4) Toronto Region - Population:

Counties	1973 Population
York (includes Metro Toronto)	2 330 027
Peel	285 321
Halton	302 594
Wentworth	408 197
Niagara	354 769
Durham	48 643
Total	3 629 551

SOURCE: Economics Analysis Branch, TEIGA more closely. According to the Canadian Daily Newspaper Association, the three Toronto dailies sell about 116 000 tons of newspapers in Metro Toronto each year.* Two firms, Inland Publishing and Metrospan, which publish most of the suburban weekly newspapers, and the numerous small ethnic newspapers that abound in Toronto are estimated to produce an additional 18 000 tons yearly.** At least 134 000 tons of newspapers are sold and presumably discarded in Metro Toronto each year.

Newspaper publishers in other cities in south-central Ontario, from Hamilton to London and from St. Catharines to Orillia, generate an additional 89 000 tons of newspapers per year.(4) Consequently, almost 220 000 tons of newspapers are estimated to be generated and discarded within 100 miles of Toronto each year.

PAPER STOCK CONSUMPTION IN CANADA AND ONTARIO

Statistics of waste paper consumption in Canada are not collected in a systematic manner. What data are available are presented in Tables V-3 and V-4 and show the amounts of paper stock consumed by the pulp and paper industry only. These are, in all cases, exclusive of internally generated broke but include purchased rolls and other types of manufacturing wastes. Statistics

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* This is net of the papers that are sent out of the area.

** Estimates by spokesmen from the Inland and Metrospan Publishing Companies.

TABLE V-3

QUANTITIES AND VALUES OF WASTE PAPERS CONSUMED, IMPORTED, AND EXPORTED - CANADA, 1966 - 1974

Year	Consumed			Imported(5)		Exported(6)	
	Tons		$000(1)	Tons	$000	Tons	$000
1966	522 781(1)		18 966.1				
1967	526 118		17 639.6				
1968	554 121		18 551.3	57 455	2 394	119 559	6 236
1969	589 591		20 961.3	74 697	3 174	113 985	6 303
1970	589 509		22 020.5	80 719	3 832	98 082	5 651
1971	671 804	819 240(2)	26 829.0	140 260	6 950	141 269	8 267
1972	768 285	859 487(3)	30 381.6	176 574	7 923	139 755	8 255
1973	846 770	890 193(3)	40 721.7	155 525	11 994	114 619	8 159
1974		907 576(4)		212 467	23 758	118 188	14 270

SOURCES: (1) Statistics Canada, Forest Products Division, Personal communication, October, 1974.

(2) G. H. Manning and M. S. Conway, Consumption of Paper Stock in Canada, 1971, Information Report E-X-21 (Ottawa: Forest Economics Research Institute, Environment Canada, May, 1973).

(3) M. J. Frost, Report on Consumption of Recycled and Reclaimed Fibre in Canada, 1972, 1973 (Montreal: Canadian Pulp and Paper Association). Excluding rejected rolls.

(4) Personal communication with David Paavila, Canadian Pulp and Paper Association, August, 1975.

(5) Statistics Canada, External Trade Division, Imports by Commodities and Countries, p 140-141.

(6) Statistics Canada, External Trade Division, Domestic Exports by Commodities and Countries.

TABLE V-4

QUANTITIES AND VALUES OF WASTEPAPER CONSUMED, IMPORTED AND EXPORTED - ONTARIO, 1966-1974

Year	Consumed			Imported(4)		Exported(4)		
	Tons		$000(1)	Tons	$000	Tons		$000
1966	263 232(1)		10 019					
1967	248 693		8 885					
1968	248 692		8 822					
1969	260 508		9 783					
1970	249 883		10 148					
1971	372 113	305 184(2)	13 064					
1972	377 615	353 499(3)	14 558	89 336	4 066	news	29 692	1 768
197						W/P nes	16 581	773
1973		425 363(3)		82 845	7 005	news	10 435	714
						W/P nes	17 088	1 192
1974				108 437		news	2 580	234
						W/P nes	25 037	3 129

NOTE: news = "newsprint, beater stock, rejects"
W/P nes = "Waste Paper not elsewhere specified"

SOURCES: (1) Statistics Canada, Annual Census of Industry (Special Compilation by the Ontario Statistical Centre), 1975.

(2) G. H. Manning and M. S. Conway, Consumption of Paper Stock in Canada, 1971. Information Report E-X-21 (Ottawa: Forest Economics Research Institute, Environment Canada, May, 1973).

(3) M. J. Frost, Report on Consumption of Recycled and Reclaimed Fibre in Canada, 1972, 1973, (Montreal: Canadian Pulp and Paper Association).

(4) Statistics Canada, External Trade Division, Special Compilation.

on the consumption of waste paper for other uses such as energy recovery, packing material, insulation, etc., are not collected and maintained by anyone. However, paper stock dealers assert that the quantities involved in Ontario are only a fraction of a percent of the amounts used by the pulp and paper industry.

Two important trends should be noted from these data. First, there has been a marked increase in annual consumption of paper stock since 1970. Prior to 1970, the annual consumption of paper stock was relatively steady at about 550 000 tons for all of Canada and 85 000 tons for Ontario. Increased consumption by Canadian and Ontario paper mills since 1970 has been paralleled by a similar surge in the growth of imports. The second trend evident in these statistics is that Canada has moved from being a net exporter of waste paper to a position of a net importer after 1971. Virtually all imports into Canada and Ontario come from the United States and nearly all waste paper exports are bound for that country as well.* In 1975, 108 000 tons of waste paper were imported into Ontario by paper mills and dealers. At least 62 000 tons were de-inking and pulp substitute grades. Of the remaining 46 000 tons, most consisted of corrugated clippings or boxes. Small amounts of waste news and mixed papers are imported as well.**

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* External Trade Division, Statistics Canada, Special Compilation

** These import figures are based on confidential data provided by individual paper mills.

The data in Table V-5 compare the amount of waste paper used in all of Canada and Ontario with the respective quantities of paper products manufactured. In either case, waste paper still constitutes a small proportion of the raw materials used by the pulp and paper industry in this country and province. The data also show the slow but steady growth since 1970 in waste paper consumption relative to total product output.

It is not clear whether the growth in waste paper consumption since 1970 represents a sustained trend or a transitory cycle. Declines in consumption from one year to the next have occurred and there is no reason that such declines could not occur in the future. However, rising wood and pulp costs together with a steady growth in the demand for paper products all point to a continuation of current levels of paper stock consumption, if not continued growth in consumption.

The data in Table V-6 show the relative distribution of paper stock grades used in Ontario. More detailed breakdowns of consumption by the various grades of paper stock and by region are presented in Appendix A.

Seventy percent of all the de-inking grades used in Canada are consumed in Ontario where the Abitibi Provincial Paper Company has the largest de-inking mill in the country. Most of the pulp substitute and de-inking papers are either sorted by dealers into the grades listed, or are baled by the generator for shipment directly to paper mills.

New corrugated cuttings are the trimmings of converting plants where corrugated boxes are made. Over-issue news consists

TABLE V-5

PRODUCTION OF PAPER AND PAPERBOARD IN CANADA AND ONTARIO COMPARED WITH CONSUMPTION OF PAPER STOCK, 1965 - 1974

(000 ton)

	CANADA			ONTARIO		
Year	Paper and Paperboard Production(1)	Paper Stock Consumption(2)	Utilization Rate*	Paper and Paperboard Production(1)	Paper Stock Consumption(2)	Utilization Rate*
1966	11 784	522.8	4.44	2 980.2	263.2	8.84
1967	11 512	526.1	4.57	2 946.5	248.7	8.44
1968	11 656	554.1	4.76	2 954.0	248.7	8.42
1969	12 788	589.6	4.61	3 006.4	260.5	8.67
1970	12 679	589.5	4.65	3 178.0	249.9	7.87
1971	12 661	671.8	5.31	3 119.0	372.1	11.93
1972	13 474	768.3	5.71	3 154.9	377.6	11.97
1973	14 293	846.8	5.93	3 474.9	425.4(3)	12.25
1974	14 985	907.6(3)	6.06			

SOURCES:
(1) CPPA Reference Tables, 1975, p 22, 26.
(2) Statistics Canada, Forest Products Division, personal communication, October, 1974.
(3) Personal communication from CPPA.

* Utilization rate = $\frac{\text{total waste paper consumed}}{\text{total production of paper products}}$

TABLE V-6

DISTRIBUTION OF PAPER STOCK CONSUMPTION BY GRADES

ONTARIO, 1971, 1972, 1973

Grade	1971		1972		1973	
	Tons	%	Tons	%	Tons	%
Pulp Substitutes	40 555	11	50 195	13	82 944	19
De-inking Grades	31 589	8	22 760	6	43 983	10
Corrugated Container	129 801	35	177 639	47	166 337	39
Newspapers	46 451	12	44 518	12	56 535	13
Mixed Papers (including boxboard cuttings)	56 780	15	82 503	22	73 364	17
Unidentified	66 937	18	--	--	--	--
Total Paper Stock	372 113	100	377 615	100	425 363	100
Total Specialty Grades, Rejected Rolls and Purchased Broke	--		49 830		67 852	
GRAND TOTAL	372 113		427 445		493 015	

SOURCES: 1971 Data: G. H. Manning and M. S. Conway, Consumption of Paper Stock in Canada, 1971, Information Report E-X-21. (Ottawa: Forest Products Research Institute, 1973).

1972 and 1973 Data: M. J. Frost, Report on Consumption of Recycled and Reclaimed Fibre in Canada. (Montreal: Canadian Pulp and Paper Association, 1972, 1973).

of the newspapers which are not sold on newstands and are returned to the distributor or publisher. Boxboard cuttings are grouped with mixed papers because boxboards are usually made of several layers of different kinds of paper fibres. Even mixed paper, the lowest grade in terms of quality and usually price, must be sorted to a certain extent to remove prohibited contaminants.

CONSUMPTION BY END PRODUCT SECTORS

Knowledge of the kind and quantities of paper stock grades which are used in different types of paper products is useful in making forecasts of the future demand for secondary fibre, because the demand for waste paper is dependent on the demand for and the consumption of final products. This information is also useful in developing policies for enhancing the demand for secondary fibres since the prospects for increasing the degree of recycling in each paper product category are different.

The consumption patterns of paper stock by different final product sectors in Canada are presented in Table V-7 for the year 1973. In addition, the total 1973 production for each of these product sectors is shown in the next to the last line of the table. It is apparent that almost 70 percent of all paper stock consumed by Canadian pulp and paper mills is used in two product groups: boxboard and building papers. The utilization ratios for these product types are 46 and 33 percent respectively.* Corrugating medium has the third highest utilization

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* Utilization ratio = $\frac{\text{total waste paper consumed}}{\text{total production of paper products}}$

TABLE V-7

CONSUMPTION OF PAPER STOCK GRADE BY PAPER PRODUCT GROUP - CANADA, 1973

(000 Tons)

Grade	Newsprint	Printing and Writing (Fine Papers)	Tissues	Coarse Kraft Papers	Container Board		Boxboard	Building Papers	Total Canada	
					Linerboard	Corrugated Medium			Tons	% Total
Mixed	9.9	---	---	---	---	---	23.5	76.9	110.4	13
Boxboard Cuttings	---	---	1.0	---	2.4	---	57.3	25.2	85.9	10
News	2.4	---	---	---	2.4	1.5	59.9	25.6	91.8	11
Old Corrugated Cuttings	---	---	---	---	69.9	37.0	95.6	44.9	247.6	28
New Corrugated Cuttings	---	---	1.1	0.1	33.2	42.7	37.4	27.5	141.9	16
De-inking	0.3	25.2	6.8	0.1	1.9	---	24.4	4.0	62.7	7
Pulp Substitutes	14.4	10.3	10.6	1.3	20.6	---	53.1	28.3	138.7	20
Total Paper Stock	27.0	35.5	19.5	1.6	130.5	81.3	351.3	232.4	879.1	100
% of Total	3.0	4.0	5.0	1.0	15.0	10.0	40.0	27.0	100.0	
Rejected Rolls and Purchased Broke	113.9	32.8	24.3	7.5	29.5	---	21.6	0.8	230.4	

Continued...

Table V-7 Continued

Grade	Newsprint	Printing and Writing (Fine Papers)	Tissues	Coarse Kraft Papers	Container Board		Boxboard	Building Papers	Total Canada	
					Linerboard	Corrugated Medium			Tons	% Total
Total Including Special Rolls and Purchased Broke	140.9	68.3	43.8	9.1	160.0	81.3	372.9	233.2	1109.5	
Total Paper Product Production (000 tons)	9140.0	1076.0	337.0	652.0	1151.0	488.0	766.0	713.0	14 323.0	
Utilization Rate (Percent Paper Stock Used in Production)	0.3	3.3	13.0	0.2	11.3	16.7	45.9	32.6	6.2	

SOURCES: Paper Stock Consumption - M. J. Frost, Report on the Consumption of Recycled and Reclaimed Fibre in Canada, 1973. (Montreal: Canadian Pulp and Paper Association, August, 1974), Table 3.

Total Paper Product Production - Canadian Pulp and Paper Association, Reference Tables 1974. (Montreal: Canadian Pulp and Paper Association), pp. 21, 25.

TABLE V-8

PRODUCTION AND PAPER STOCK UTILIZATION OF MILLS IN ONTARIO WHICH CONSUME PAPER STOCK, 1973-74

Product Type	No. of Mills[1]	Total Production Capacity	Consumption of Paper Stock	Rate of Recycling
		Tons/yr.	Tons/yr.	%
1. Boxboard	4	195 500	169 736	87
2. Corrugated Containers[3]	3	135 200	96 050	71
3. Building Materials	5	204 050	122 200	60
4. Fine Papers	3	340 000	34 500	10
5. Tissue	2	70 000	19 800	28
6. Newsprint	1	240 000	10 000	4
TOTAL			452 236	

NOTE: This data is approximate

SOURCE: Production Capacity: Pulp and Paper Canada: 1975 Business Directory (Westmount, PQ: Southam Business Publications Ltd., 1975).

Consumption of Paper Stock: Data provided by individual firms.

ratio of 17 percent. In terms of absolute tonnage of waste paper used, boxboard is first, building papers is second and linerboard ranks in third place.

Boxboard and building paper mills utilized nearly all of the mixed and newspaper grades of paper stock consumed in Canada during 1973. Moreover, 53 percent of the corrugated boxes and cuttings were also used by these two product sectors. Only de-inking grades and pulp substitutes are used in the manufacture of wrapping, fine papers and tissue papers. The CPPA did not release similar data on a provincial basis. However, total production capacity of specific products in Ontario and the total amount of paper stock used by Ontario mills in each product sector is provided in Table V-8. The utilization ratio is also provided for each of these product groups.

The information presented in Tables V-7 and V-8 can be used for predictive purposes in the following manner. Assuming that the technical ratios represented by the data in the tables remain constant, the effect of increased paper product output on paper stock production may be predicted. For example, from Table V-7, an increase in production of fine papers by 100 000 tons implies an increase in paper stock consumption of 3300 tons. Of this 3300 tons, 2342 tons would be de-inking and 958 tons would be pulp substitutes.

On the other hand, an expansion in the output of boxboard by 100 000 tons would imply an increase in 45 900 tons of paper stock on a national basis and almost 87 000 tons if the mills were in Ontario. Of the 87 000 tons that could be used by mills in Ontario, about 20 000 tons would be mixed grades, 14 800 tons would be waste news, 32 900 tons would be corrugated and 19 200 tons would be premium grades.

REFERENCES: CHAPTER V

1. Peter Middleton and Associates Ltd., COMPOSITION AND QUANTITY: A CRITICAL EVALUATION OF EXISTING DATA, Vol. 1, A Municipal Solid Waste Management Study (Toronto: The Pollution Probe Foundation, 1975).

2. Arsen Darnay and William E. Franklin, SALVAGE MARKETS FOR MATERIALS IN SOLID WASTES (Washington, D.C.: U.S. Government Printing Office, U.S. Environmental Protection Agency, 1972), pp. 45-49.

3. R. A. Daly and Co., THE CANADIAN FOREST PRODUCTS INDUSTRY (Toronto: R. A. Daly and Co. Ltd., January 1969), pp. 24-25.

4. Mr. W. Templar, Canadian Daily Newspaper Association, Toronto, Ontario.

CHAPTER VI

DEMAND, SUPPLY AND PRICES

Detailed analyses of demand, supply and price relationships which characterize waste paper markets can be found in several recent studies, one of which deals specifically with Ontario(1, 2, 3). The discussions in this chapter will focus on those factors which determine supply, demand and prices in the Ontario market for waste paper. Moreover, the problems and issues which act to constrain the demand for and the supply of waste paper will be identified and analyzed.

Analyses of demand and supply in a market context invariably include an implicit reference to price. Thus, "supply" refers to the various amounts of a product which generators or dealers would make available at different prices. Similarly, "demand" always refers to different amounts of waste paper or paper stock which a mill or a dealer would purchase at different price levels. The factors which influence demand and supply are thus considered in the context of these price-quantity relationships.

DEMAND

Secondary material dealers emphasize that "scrap is bought, not sold." This adage has been substantiated by economic studies of waste paper markets in the U.S.(4). They confirm that shifts in demand rather than supply determine the levels of waste paper consumption and paper stock prices. An understanding of the factors which affect and constrain waste paper demand are, therefore, essential to the development of policies to enhance paper recycling.

Nearly all waste paper is consumed by the pulp and paper industry so that demand for this commodity originates with paper mills. The dealer-broker sector of the market has virtually no effect at all on demand.

Demand conditions for different grades of waste paper vary considerably. Other than during exceptional periods of low demand (strikes, business recessions), most mills will use all of the clean "packs" of pulp substitute grades they can obtain, so long as the price of the material is somewhat lower than the cost of virgin pulp. De-inking grades also enjoy a strong demand by Abitibi, Provincial at Thorold, by some tissue mills and by boxboard makers. Generally, dealers have no difficulty in selling all the pulp substitute and de-inking grade waste papers that they can generate and at prices which permit them to sort these papers prior to baling. On the other hand, the market will seldom utilize all of the bulk grades that are available for sale. Consequently, the problems associated with premium grades are essentially concerned with their supply while those affecting bulk grades are related to the expansion of demand for these commodities.

Waste paper consumption in the paper industry is a consequence of:

1) the demand for and the consumption of final paper products,
2) the proportion of paper stock used to make final paper products.

If the demand for paper products increases, then the demand for all inputs, including waste papers, increases proportionately. If mills increase the proportion of paper stock in final products, then the demand for waste paper alone will be increased. The scope for expanding the demand for waste paper through an increased demand for paper products will be discussed first.

The current waste paper utilization rate in Ontario is about 12 percent.* This implies that if paper production increased by 100 000 tons and this increase was distributed evenly over all mills, waste paper consumption would increase by 12 000 tons. However, the actual increase in waste paper demand could be substantially less if the production increase were to take place in newsprint mills, liner board mills or other mills which do not use waste paper.

Data in Chapter IV show that boxboard, building board and container board are the primary consumers of bulk grade waste papers. Increases in the demand for these products would result in substantially larger increases in the demand for waste paper. A brief analysis of these product sectors presented in Appendix C indicates that the consumption of boxboard and building board is growing slowly relative to other paper products. Moreover, because these paper products are used primarily as a packing material for manufactured goods and in new construction,they are especially prone to fluctuations in demand due to business cycles. The slow and often erratic growth patterns characteristic of these commodities constitute an important constraint to expanding waste paper demand.

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* Utilization rate $= \frac{\text{total waste paper consumption}}{\text{total paper product production}}$

One approach, therefore, to increasing the level of paper recycling is to stimulate growth in the demand for the products of these paper stock-using mills. There are three approaches with which the provincial or federal governments might try to achieve this. Laws and regulations could be enacted to require consumers to use paper products instead of substitute materials such as plastics. A second approach is to tax plastics, bleached kraft products and virgin fibre corrugated containers so as to make them more expensive than boxboard, building boards and liner board which contain recycled fibre. A third approach is to stimulate the demand for the desired products through government purchasing.

There are, however, some problems involved in implementing each of these approaches. Direct regulation of products is difficult to enforce and may impose serious inefficiencies on the industries concerned. Discriminatory taxation runs contrary to prevailing philosophies of equity in public finance. Finally, both the federal and provincial governments purchase few, if any, boxboard, building board or container board products directly. It appears, therefore, that there is little that governments can do to directly stimulate the demand for waste paper by this means.

The second way in which waste paper demand might be increased is for mills to increase the relative proportion of waste paper pulp used to make products. Based on the data provided in Tables IV-4 and IV-5, there would appear to be considerable scope for this approach. What might be done to get mills to use more waste paper depends on an understanding of the factors which determine how much waste paper a given mill currently uses. The extent to which waste paper is used by a mill relative to primary fibre is governed by three classes of factors:

1) technical factors,
2) cost factors,
3) marketing factors.

Technical factors refer to the equipment and know-how which permit a mill to use waste papers. Cost factors refer to the costs of using waste paper relative to the cost of using wood pulp. Marketing elements of demand concern the quality characteristics of the final products and the effects which waste papers have on these characteristics. Technology is not a barrier to increased recycling of paper.* Cleaning and processing equipment can be added to existing mills or new mills can be built which are capable of making nearly all paper products from 100 percent waste paper(5). However, existing mills which do not have such equipment cannot use all but the cleanest grades of pulp substitutes. Even those mills which currently use waste paper are equipped to handle only certain grades.

Cost factors refer to costs of using waste paper to make a particular product compared with the costs of using virgin wood pulp. In a more formal terminology, these factors are the price of the product (waste paper) and the prices of substitutes (pulp). The primary cost elements involved in using waste paper are listed in Table VI-1 along with those associated with integrated and non-integrated mills which use wood pulp. As indicated in Table VI-1, there

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* This conclusion was developed through interviews and surveys of the literature. See for example: Midwest Research Inst, Paper Recycling-The Art of the Possible 1970-85 (New York: American Paper Inst., Inc. 1973) Chapter 6.

TABLE VI-1

COST ELEMENTS OF PRIMARY AND SECONDARY FIBRE MILLS

Integrated Pulp and Paper Mill	Non-integrated Virgin Fibre Paper Mill	Recycling Mill
1. Production of pulp a) bleaching	1. Purchase of pulp a) price of pulp b) transportation c) storage	1. Purchase of waste paper a) price of waste paper b) transportation c) storage
2. ***	2. ***	2. Pre-sorting - losses
3. Pulp already in slush form	3. Pulping and refining	3. Pulping and refining
4. Cleaning a) centrifugal cleaners	4. Cleaning	4. Cleaning a) centrifugal cleaner b) deflaker c) de-inking - cooking and washing NB: This step is not performed for boxboard, container board and building board.
5. Losses from stock preparation	5. Losses from stock preparation	5. Losses from stock preparation
6. ***	6. ***	6. Damage and down-time to paper machine
7. Waste disposal	7. Waste disposal	7. Waste disposal
8. Amortization of capital costs	8. Amortization of capital costs	8. Amortization of capital costs
9. Overhead - management, sales, etc.	9. Overhead - management, sales, etc.	9. Overhead - management, sales, etc.
10. Taxes	10. Taxes	10. Taxes

*** No equivalent step.

are a number of processing steps which are necessary in a recycling mill which could make the preparation of waste paper more costly than the preparation (but not the manufacture) of wood pulp. The key cost element is, therefore, the price of waste paper relative to the cost of making or buying virgin wood pulp. Industry sources have indicated that a difference of at least $35-45 per ton must exist between the price of market pulp and comparable grades of paper stock in order for waste paper processing operations to be profitable(6, 7).

Both integrated and non-integrated wood pulp mills use pulp substitutes if and when they are available at delivered costs lower than the costs of wood pulp. In addition, they will turn to pulp substitutes and other premium grades of paper stock during temporary periods of pulp shortages. However, if these mills are to use de-inking or bulk grades of waste paper on a regular, long term basis, the following considerations must be made. A non-integrated, virgin fibre mill must compare the costs of transportation, the capital costs of extra cleaning and pulping equipment and any extra operating expenses involved in using paper stock with the price of equivalent amounts of wood pulp. An integrated mill must additionally consider the balance between its pulping and paper-making capacity. If the capacity of the paper machine exceeds its pulping capacity, then the costs of expanding the pulping facilities are compared with the costs of expansion using waste paper. If the opposite (and more common) situation prevails, the costs of processing waste paper must be compared with the revenue that can be obtained by selling the market pulp.

The third set of determinants of demand are marketing factors. These refer to the quality characteristics, in terms of function and appearance, which paper manufacturers claim are essential to the marketing of their products.

Those involved with paper manufacturing maintain that their marketing conditions and paper quality characteristics are specified by the customers.* Mill managers thus endeavor to manufacture products at the lowest cost possible while meeting the product quality characteristics supposedly specified by customers. The use of more waste paper would require, according to this view, customer acceptance of "lower" quality products. There are, however, a number of quality characteristics which are more or less determined by the mills themselves and which could be altered to favour the use of recycled paper. In periods of slack or stabile demand, paper manufacturers tend to stress "higher" quality characteristics to the exclusion of recycled fibre. In periods of growing paper demand, mills are able to sell products which are spotty, grey, or have lower strength characteristics. There appears to be some scope for product quality adjustments that could favour the inclusion of waste papers. Moreover, customer acceptance could be achieved if the paper industry were to cooperate in bringing it about.

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* "The quality specifications of most fine papers are determined largely by the requirements of the user, in our case, primarily the printer. In some instances, these requirements are modified, almost always upwards, by advertising agency personnel, particularly in the area of brightness and similar visual properties. These aesthetic qualities are often costly to obtain and invariably limit or preclude the use of secondary fibre." Personal communication from D. W. Peat, Mill Manager, Abitibi Provincial Paper Ltd.

The foregoing analysis indicates that government efforts to stimulate increased consumption of waste paper by individual mills must be directed at each of these components of demand. For example, tax deductions could be allowed to paper mills for using certain grades of waste paper. Similarly, tax concessions could be granted to mills which instal waste paper processing equipment. Governments at all levels could easily require the inclusion of a minimum recycled content in their own paper purchases and adjust their paper quality specifications to facilitate this. Paper products which governments buy could be made more recyclable. These policies have already been implemented by a number of firms such as Bell Canada and Consumers' Gas.

The discussions found in this and previous chapters have alluded to certain problem areas which act to constrain the demand for waste paper under the prevailing market conditions. A summary analysis of these five problem areas is presented in Table VI-2. The market components from which the problem originates, the components which are affected, the causes of the problem and the effects or implications of the problem are presented for each problem area.

Of the five constraining factors listed, slow growth in the paper stock-using sectors of the industry and the dearth of commercially viable new products made from bulk grades of waste paper are by far the two most important. Fluctuations in the demand for waste paper and the consequent effect on prices constitute a constraint because generators, dealers or mills

TABLE VI-2

SUMMARY OF PROBLEMS WHICH CONSTRAIN THE DEMAND FOR WASTE PAPER BY THE PAPER INDUSTRY IN ONTARIO

Problem Area	Slow Growth in Boxboard and Building Board Sectors	Lack of New Products Made From Waste Paper, Particularly Bulk Grades	Location and Design of Existing Facilities	Fluctuations in Demand and Price of Paper Stock	Quality Specifications of Final Products
Source Component	Paper Product Consumers Mills		Mills	Paper Product Customers Mills	Paper Product Customers Mills
Component Affected	Dealers	Dealers	Dealers Generators	Dealers	Dealers Generators
Causes	1. Boxboard products are used by other slow growing sectors. 2. Competition from bleached kraft and other materials 3. Construction industry	1. Virgin materials are cheap relative to secondary materials. 2. R. & D. funds limited. 3. There are few incentives for developing such products.	1. Historical patterns of development 2. Government policy of encouraging northern development 3. Tax concessions for using pulp wood	1. Changes in demand for paper products 2. Mill shutdowns 3. Mills do not store paper stock. 4. Supplementary users	1. May be used as competitive inducements in lieu of price 2. Quality may be "overspecified", e.g. strength requirements for shipping containers 3. Customers may have bias against "used" materials.
Effects	1. Demand for bulk grades decline relative to supply.	1. Oversupply of bulk grades 2. Newsprint de-inking has the greatest potential at this time.	1. Companies have not invested in recycling mills. 2. Mills use paper stock only to supplement their fibre supply.	1. Discourage investment in waste paper-using facilities 2. Discourage recovery and recycle 3. Discourage investment in technology at dealer level.	1. Manufacturers must "meet competition", reluctance to promote "lower" quality products. 2. Mills will not use "dirty" or contaminated waste paper.

are reluctant to invest in waste paper recovery or processing facilities. Price changes or a disappearance of demand could make such facilities uneconomical or redundant.

In fact, less volatile demand and price patterns could be achieved if more waste paper were used by sectors other than boxboard, building board or container board. For example, a firm which built a newsprint de-inking mill would likely want to obtain long-term (1 year or more) contracts for supplies of waste news at a stable price. These contracts would have the effect of stabilizing the prices of waste news as well as expanding the demand for waste newspapers. Mills would have to offer prices that were high enough to enable dealers and municipalities to cover the costs of a sustained effort to recover newspapers.

What are the prospects for increasing the amounts of waste paper, especially bulk grades, consumed by Ontario paper mills? The boxboard, building board and container board mills which currently use waste paper are not likely to significantly increase their consumption. Conditions at the newsprint mills listed in Table IV-5 are not amenable to the use of paper stock either. These mills are located in the north away from waste paper sources. They tend to be large, integrated pulp and paper operations so that the cost of pulp is relatively low and they do not have the equipment necessary for processing and cleaning paper stock. Finally, most of these mills export newsprint to the U.S. so that the Canadian or the Ontario governments are in no position to influence the quality requirements of paper product consumers.

The potential and the prospects for increasing the proportion of waste paper consumed by mills in Ontario are assessed in Appendix D. The mills which have been identified as having a potential for using a greater percentage of waste paper are listed in Table VI-3. Six of the 8 mills listed would use only premium grades and would require de-inking facilities to use even these papers. The other two mills would potentially use more waste newspapers and old corrugated boxes. None of these mills have much of a potential to use more mixed papers.

Newsprint mills can use unde-inked waste news to supplement wood pulp furnish up to about 5 percent by weight. If all the newsprint mills listed in Table IV-5 were to add waste news up to only 3 percent of total production, waste news consumption would amount to over 69 000 tons per year. However, interviews with executives from several newsprint manufacturing firms and a review of the literature indicates that newsprint mills are extremely reluctant to utilize waste news in this fashion. The reasons given are that the ink and other contaminants from the waste news would adversely affect paper quality and could damage the paper-making machines. Moreover, the mills in question would have to invest in cleaning and additional pulping equipment to enable them to use waste news. There is also a risk of substantial paper machine down-time in order to make adjustments and to clean the felts and wires. Finally, much of the waste news would have to be shipped from Toronto or another southern urban centre. Shipping costs could make the material more costly than the wood pulp already being produced at these mills.

TABLE VI-3

PAPER MILLS IN ONTARIO WHICH HAVE POTENTIAL FOR INCREASING THEIR CONSUMPTION OF WASTE PAPER

Mill and Location	Products		Paper Stock		Potential For Increased Use of Paper Stock
	Name	Capacity ton/year	Current Consumption ton/year	Grades Currently Used	
Newsprint					
Ontario Paper Co., Thorold	Newsprint	240 000	10 000	Newspapers	Instal a newspaper de-inking plant
Container Board					
Domtar Packaging, Trenton	NSSC pulp corrugating medium	60 200	18 000	Corrugated clippings	Use post-consumer corrugated boxes
Fine Papers					
Abitibi Prov., Thorold	Fine papers	90 000	31 500	Pulp substitutes and de-inking grades	Use more de-inking grades
Domtar Fine Papers, Cornwall	Fine papers	200 000	500	Pulp substitutes	Add a de-inking facility
Domtar Fine Papers, St. Catharines	Fine papers	50 000	2 500	Pulp substitutes	Add a de-inking facility
Tissue					
Kimberly-Clark, St. Catharines	Tissue	35 000	15 000	Pulp substitutes	Use more pulp substitutes
Kimberly-Clark, Huntsville	Tissue	35 000	14 000	Pulp substitutes	Use more pulp substitutes
Dominion-Cellulose, Toronto	Tissue	50 000	-	None	Use pulp substitutes

SOURCE: Appendix D

Probably the most significant possibility for stimulating the demand for bulk grades is to establish a waste news de-inking mill in Southern Ontario. Such a facility would provide a major impetus to the demand for waste newspaper and it has been explained how such a facility would help to stabilize waste news prices. Such a mill could be established under government auspicies but would require a substantial amount of money and technical expertise to build and operate it.

SUPPLY

There are two market levels for which factors that influence supply can be identified:

(1) the supply of waste paper to dealers,

(2) the supply of paper stock to mills.

The factors which determine the amounts of waste paper available to dealers at different price levels include:

(1) prices of waste paper,

(2) contamination,

(3) time.

Greater supplies of waste paper can be recovered at higher costs to generators and to dealers. Generators must incur higher costs of separation, handling and storage to recover more usable waste paper. Dealers must incur higher collection costs to obtain papers from small printing and converting shops or from other sources. Obviously, these higher-cost waste paper supplies can be recovered only if the prices paid ultimately cover these costs, or if they are somehow subsidized.

Theoretically, higher levels of contamination imply higher costs of separation and cleaning. In practice, mills avoid and reject "packs" which are contaminated with prohibitive materials. Only during periods of rising waste paper demand, such as the period of mid 1973 to mid 1974, will some mills relax their quality requirements and use paper stock which they would otherwise reject. During periods of level or falling demand (which are more prevalent), a lower overall quantity of paper stock is available which will meet mills' quality requirements at prevailing price levels. Increasing contamination of waste papers, both by materials intentionally bound to paper and by tramp materials, is considered a major constraint to increased recycling in Ontario and Canada.

Time is important in terms of the "short run" (one to seven days) and the "long run" (up to a year or more). Paper stock supplies are virtually fixed in the short run. It takes time for waste paper dealers to search out, arrange for and physically deliver new quantities of paper stock. In the meantime, consumers of waste paper must bid for the material that is currently available. It also takes some time for dealers to turn off supplies when demand declines. Dealers are often committed to remove waste papers from generators who view the function as a waste disposal service. Moreover, the amount of waste paper discarded is completely independent of demand and can be quite variable. The difficulty and expense of developing new supplies or turning off current sources when demand declines varies considerably from one paper stock grade to another.

The supply of paper stock to mills is dependent on

(1) prices of paper stock,

(2) time.

Paper mills require that waste paper be sorted, graded, baled and free from contaminants. The higher the price offered or established in the market, the more that dealers can spend on sorting and transportation of the waste paper. Hence, more paper stock can be made available. Similarly, the longer the time period, the more paper stock supplies can be processed and accumulated.

Supplies of both waste paper and paper stock are determined initially by the prevailing market price. Because labour costs of sorting are so high, contaminated waste papers are usually discarded thus limiting supplies to uncontaminated sources. Finally, the more time that is available, the more that generators and dealers are able to respond to price changes.

Bulk grades, particularly newspapers and mixed papers, tend to be in a chronic condition of excess supply. This means that all available supplies will not be consumed at a given price level, especially at very low price levels which are common to these grades. The low cost sources of waste newsprint are overissue newspapers and other waste papers from newspaper publishers. Dealers are usually committed to take this material and will do so despite fluctuations in demand and price in order to keep these supplies. Other waste news is obtained from community organizations who use volunteer labour to collect the material and who are often prepared to do so even when prices paid to them are as low as $5.00 per ton. Dealers are able to turn volunteer sources on and off with relative ease without fear of losing these "accounts." Additional supplies of newspapers and mixed papers can, therefore, often be obtained at virtually no extra cost. Corrugated boxes are also generally available in excess of demand. Recovery of newspapers and old corrugated boxes is aided by the fact that the preparation of these materials for disposal is essentially the same as that required for recovery.

By contrast, virtually all economically available supplies of premium grade waste papers are fully exploited by waste paper dealers. There is often intense competition among dealers for premium paper with some dealers attempting to bid sources away from other dealers. Untapped sources of premium grade paper stock consist of small printing and manufacturing establishments with low volumes of wastes and office wastes which require extensive sorting. Dealers will recover paper from these sources only when prices are high enough to cover the extra costs of collection and sorting. Some dealers argue that, even with higher prices, few additional supplies of premium grades would be forthcoming, because office wastes are too contaminated and the smaller generators cannot be induced to separate their wastes. The current high prices for premium grade papers coupled with the perennial complaint by mills that they cannot obtain enough "clean" high grade paper tend to support this argument. However, government programs could be directed at organizing the recovery of high grade paper from its own facilities. Moreover, governments can undertake research and the promotion of at-source separation systems, something that dealers and brokers would normally not have the resources to do.

Since six of the mills identified in Table VI-3 as having a potential for increased waste paper consumption will require either pulp substitutes or de-inking grades, the supply of premium grades of waste paper is a key limiting factor to expanded waste paper recycling. The amounts of premium grades currently being recovered and recycled in Ontario is by no means equal to the potentially recoverable amounts of premium grade waste papers currently being discarded.* Large amounts of potentially recoverable premium grades of waste papers are being discarded because they are too contaminated, because they are too costly to collect and sort, because dealers are not able to organize recovery operations in some large institutions and because cheap, efficient refuse collection and disposal systems make discarding waste papers less expensive and more convenient than recovery. These problems and constraints which affect the supply of waste papers, particularly premium grades, are summarized in Table VI-4.

The foregoing analyses suggest some possible government actions which could further stimulate increased recycling. First

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* In 1973, 27 000 tons of premium grades of paper stock and 142 000 tons of new corrugated clippings were consumed by the paper industry. The data in Table V-1 indicate that almost 550 000 tons of fine papers were potentially recoverable while more than 500 000 tons of corrugated containers were generated as potentially recoverable waste paper as well.

TABLE VI-4

SUMMARY OF PROBLEMS WHICH CONSTRAIN THE SUPPLY OF WASTE PAPER IN ONTARIO

Problem Area	Logistic and Operational Problems	Limited Supply of Premium Grade Waste Papers	Increasing Contamination	Efficient, Low Cost Solid Waste Collection and Disposal Systems
Source Component	Dealers Generators	Dealers Generators	Generators Paper products	Dealers Generators
Component Affected	Mills	Dealers Mills	Dealers	Mills
Causes	1. Dealers are labour intensive. 2. Little provision for recovery and recycling on the part of generators 3. Little systematic study of management and technology of secondary material. 4. Scale and authority of some recovery operations beyond scope of dealers.	1. Increasing contamination 2. Rising costs of labour 3. No reliable mechanical separation systems	1. Intentional coatings, laminations, adhesions, of new materials 2. Growth in use of plastic 3. Rising cost of labour to separate materials 4. Objective of generators to dispose of waste, not to recover.	1. Materials are cheap relative to labour. 2. Manufacturers are not responsible for the disposal of their products. 3. Consumers are often not aware of the costs of collection and disposal of their solid wastes. 4. Environmental costs of landfill and incineration not included in disposal costs.
Effects	1. Dealers recover less paper than might be feasible. 2. Costs of collection and recovery operations are higher than might be possible.	1. Hand separation is becoming more and more expensive. 2. Expansion of some recycling facilities might be curtailed.	1. High costs of sorting and cleaning. 2. Many mills cannot use paper stock. 3. More waste paper discarded rather than recycled	1. Materials are discarded because it is cheaper than the cost or inconvenience or recovery and recycling. 2. All wastes are collected together in order to lower costs. Papers are usually contaminated. 3. Supply of premium grade waste papers is decreased.

of all, the provincial and federal governments could support and undertake research and development into more efficient at-source separation techniques and systems. Moreover, governments at all levels could organize the recovery of premium grades from their own facilities and from groupings of private generators that would normally be beyond the scope of waste paper dealers. Governments could also enact regulations and programs aimed at making products more recyclable.* Governments could also provide assistance to dealers in the form of research and development on mechanical separation devices or by extending tax concessions to dealers for the purpose of purchasing equipment.

Finally, municipal agencies and the provincial government could study solid waste collection practices to determine how they might be altered to make materials recovery more attractive to generators. For many generators, the decision not to recover has been made on the basis of custom, previous patterns of behaviour and opinion rather than a systematic financial evaluation of the relevant alternatives. In fact, generators are often completely ignorant of their costs of waste collection and disposal. Development of new ways of stimulating at-source separation and recovery of materials for which there is an adequate demand should be part of any comprehensive recycling effort.

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* For example, Bell Canada already requires that the makers of its yellow pages use water soluble dyes and that the adhesives it uses in binding telephone books are all water soluble.

WASTE PAPER PRICES

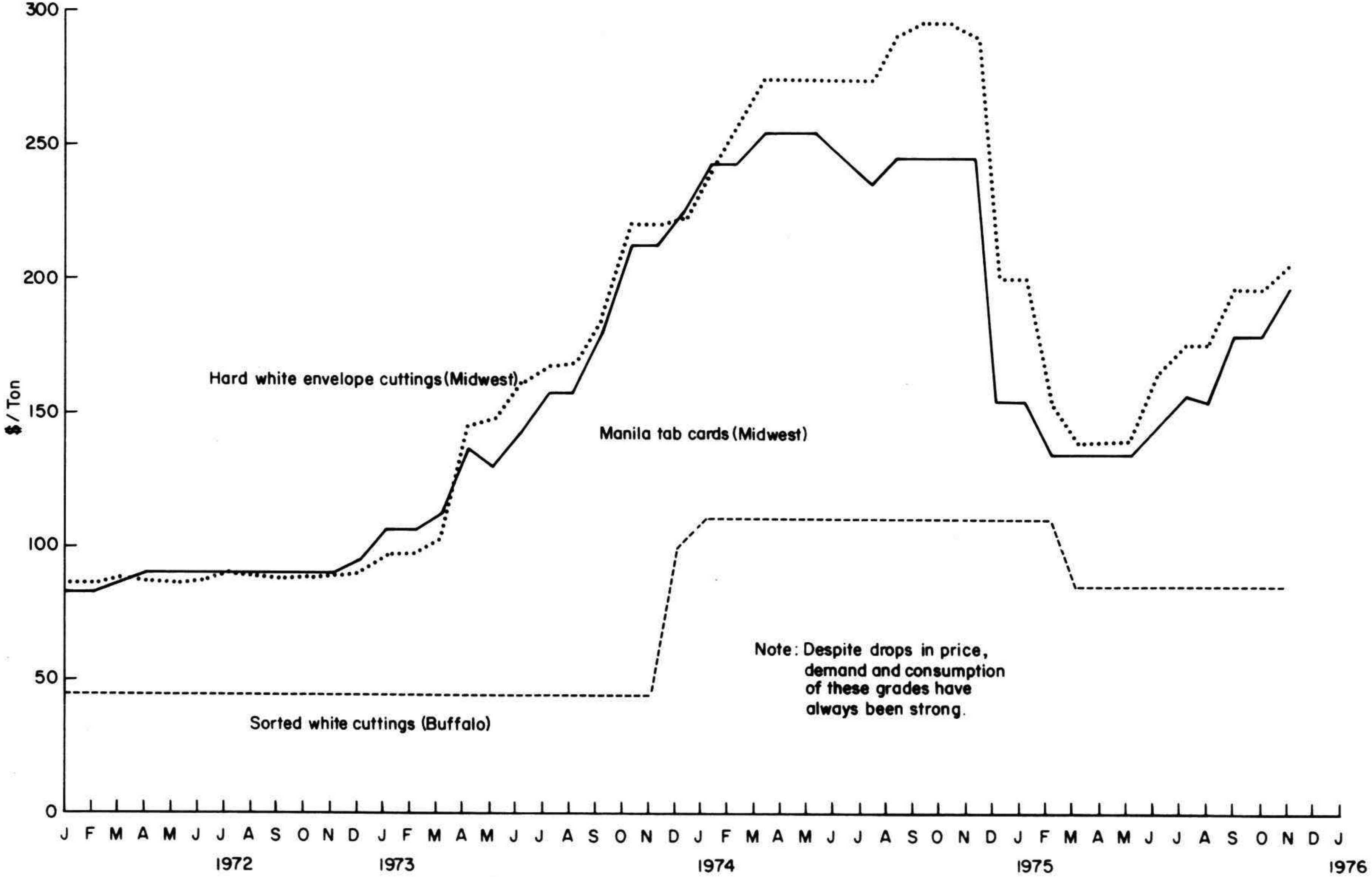
The supply of paper stock is essentially fixed in the short run since it takes time for dealers to obtain additional quantities of waste paper or turn off sources of supply when demand declines. Consequently, when demand increases, consumers of waste paper bid against each other to obtain current supplies thus pushing up prices. When mill requirements decline due to decreased orders, shut downs, strikes or product changes, dealers and generators cut prices to move their inventory to make room for the additional waste papers being generated. Until recently, paper mills have seldom stored more than 30 days' supply of paper stock, purchasing only enough to meet their current operations. When these current operations are curtailed, so are paper stock purchases.

The extent to which price fluctuations have taken place over the past five years are described below. Unadjusted prices for selected paper stock grades are shown in Figures VI-1 and VI-2. These prices are those paid by mills to dealers or generators in the Buffalo area. Actual waste paper prices in Ontario tend to be somewhat higher than Buffalo, but paper stock dealers and paper mill representatives confirm that the Buffalo data accurately reflect price changes that have occurred in Ontario.

The unprecedented rise and fall of prices that occurred from October, 1973, to August-September, 1974, indicate how volatile this market is with respect to prices, as well as how difficult it is to achieve a sustained expansion in the demand for waste paper.

FIGURE VI-1

WASTE PAPER PRICES – BUFFALO, N.Y. – PREMIUM GRADES (PULP SUBSTITUTES)

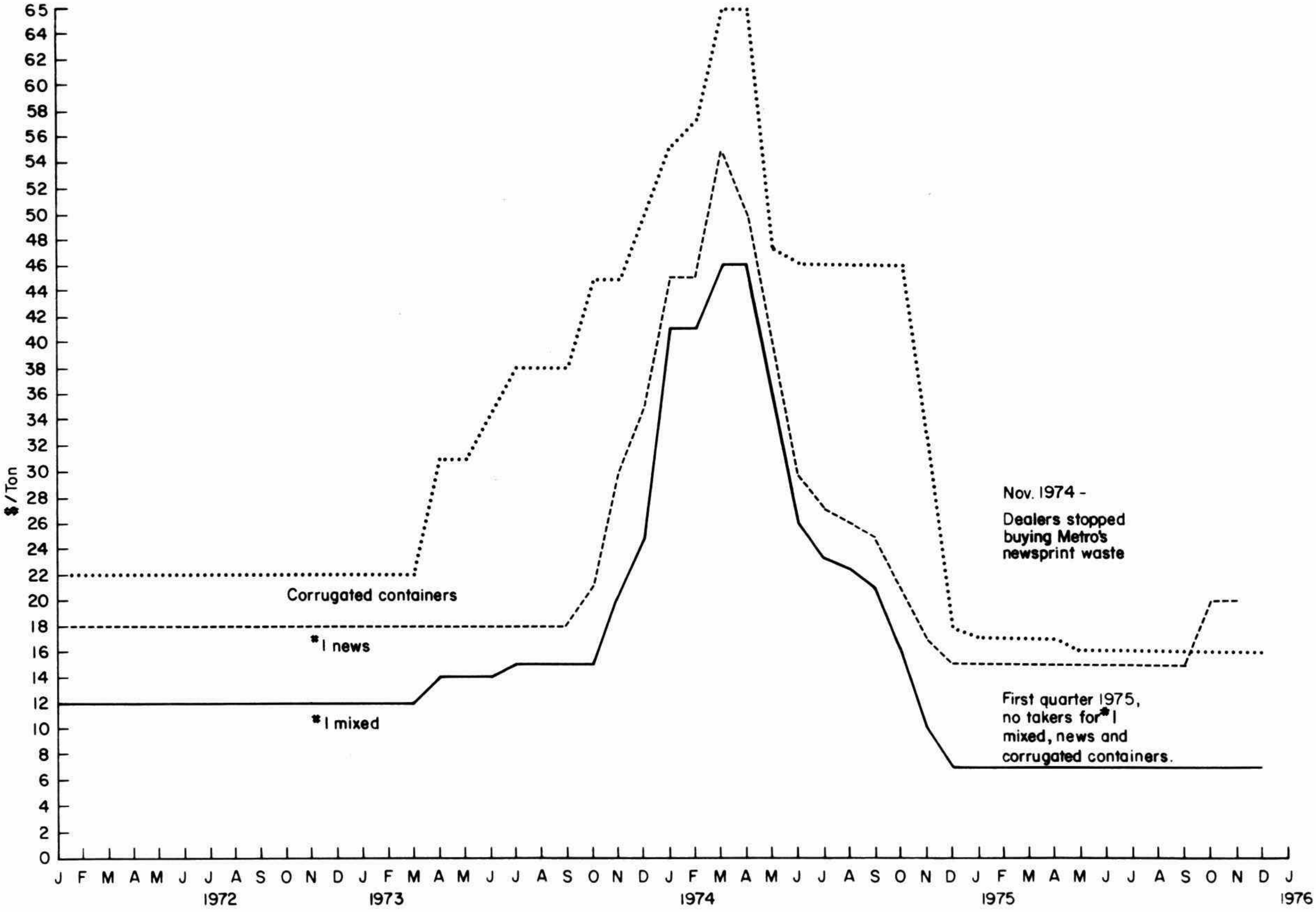


Note: Despite drops in price, demand and consumption of these grades have always been strong.

Source: Official Board Markets (Chicago: Magazines for Industry Inc.), Data from first week of each month.

FIGURE VI-2

WASTE PAPER PRICES, BUFFALO, N.Y. — MIXED, NEWS & BULK GRADES



Source: Official Board Markets (Chicago: Magazines for Industry, Inc.), Data from first week of each month.

As is shown in Figures VI-1 and VI-2, the prices of both bulk and premium grades of paper stock rose by almost 100 percent between October, 1973 and April, 1974. During the summer and fall of 1974 prices of all grades began falling until they leveled off in December, 1974. The prices of bulk grades dropped to price levels below that of the previous years. While the prices of premium grades declined as well, they did not go below levels that prevailed before the boom. Moreover, the prices of premium grades soon began to climb again as demand picked up. This is indicative of the steady demand that exists for pulp substitutes and de-inking grades of paper stock. This steady demand permits dealers to pass on any extra costs of collection and sorting necessary to obtain additional supplies of premium grades. On the other hand, the prices of bulk grades declined to nominal levels, reflecting only transportation and handling costs.

These wide fluctuations in prices were caused by a temporary shortage of market wood pulp. Paper-making capacity had expanded beyond pulp-making capacity so that many mills turned to paper stock to supplement their fibre supply. When pulp manufacturing capacity caught up to demand, these mills dropped out of the waste paper market. In addition, paper product demand began to decline at the same time (last half of 1974). The combined effect of these two factors sent paper stock prices plummeting in the fall of 1974.

Over the long run, the prices of premium grades are related to the price of virgin pulp. Paper stock prices tend to remain proportionately lower than primary pulp prices reflecting the added costs of cleaning and sorting which must often be applied even to premium grades. On the other hand, long run prices of bulk grades, news, corrugated and mixed, are determined by the costs of collection and sorting. If mills offer prices for bulk grades that are lower than these costs plus some profit, dealers simply will not, and increasingly do not, offer these grades for sale.

Dealers stress, and experience shows, that rising prices for waste paper is an effective stimulus for increasing recycling under prevailing market conditions. At $40-$50 per ton, "people in Cadillacs were bringing their newspapers to us."(8) The maintenance of high waste paper prices by such government actions as subsidies or a marketing board might seem to be a logical extension of this finding. However, it is the demand for and utilization of waste paper which is crucial to a sustained increase in recycling. High prices are a consequence of this higher demand, not a cause of it.

Wide price fluctuations such as those experienced during 1973-74 actually inhibit the expansion of recycling in two ways. First, firms are reluctant to invest in new waste paper using plants and equipment when the prices of the primary raw materials are subject to wide and unpredictable swings. Since fibre costs are a large proportion of the operating costs of a recycling mill, waste paper price increases could make a potentially profitable operation uneconomical in a short time. On the other hand, investments in new waste paper consuming plants, such as a newsprint de-inking mill could help to stabilize prices.

A second reason why price instability curtails recycling is that periodic price declines make recovery and collection of waste papers from some generators uneconomic. Waste paper generators will abandon their efforts at recovery and recycling so as to avoid future inconvenience and bother due to interruptions in their waste removal service.

COMPETITION AND MARKET POWER IN THE WASTE PAPER MARKET

Paper stock prices are generally set by paper mills. This advantage resides in the mill sector for several reasons. First, there are fewer paper stock-using mills than there are paper stock dealers who sell to the Ontario market. In addition, not all mills use the same grades of paper stock. Thus, for any particular grade, the number of potential buyers is reduced even more. Finally, if paper mills are not buying paper stock, dealers have no alternative customers to turn to.

However, mills cannot drive prices down at will. No single mill buys enough material to do this nor are paper stock-using mills' operations similar enough to co-ordinate purchases and control prices. Indeed, it would not be in the mills' interests to keep prices unmercifully low even if they could. This would drive smaller dealers out of business and permit larger dealers to monopolize the market. Mills would then be vulnerable to price manipulation by the dealer sector. Spokesmen for paper mills indicated that, in periods of falling prices, they would sometimes pay premium prices to their chief suppliers in order to keep them in business.

For their part, waste paper dealers have much less control over prices than do mills. There are 6 major dealers and brokers in Toronto, an additional 18 in other Ontario cities and at least two large dealers in Buffalo who all compete for the same paper stock customers. Several mills, such as Atlantic Packaging in Scarborough and Sonoco Ltd. in Brantford, have developed their own sources of waste paper as well as buying from dealers. One of the larger waste paper-using mills in Ontario buys its paper stock from 13 separate dealers, one of which is located in New York City. Mill representatives interviewed expressed no indication or concern that dealers had any control over prices.

The present investigation revealed no evidence of any collusion among dealers to control prices paid to generators or to extract higher prices from mills. The waste paper business is easy to enter when prices are high. Waste paper dealers can obtain higher prices for the material they have on hand when demand increases. However, dealers cannot sustain their market advantage over mills in the face of a steady or declining demand.

Waste paper dealers have been accused of manipulating the prices offered to generators of waste paper. These assertions generally come from generators of bulk grades who find prices have dropped or demand has dried up. As already explained, the demand for these grades of paper stock is generally insufficient or transitory. On the other hand, generators of premium grades gave no indication that they had been abused by dealers. In fact, dealers complained that the prices and extra services that they had to give to some generators in order to obtain desirable grades were excessive. There were always other dealers or brokers who were ready to take these "accounts" if the generator felt that he was not getting a fair price.

COMMENTS ON FORECASTING

The discussions in this chapter have dwelled primarily on the past performance of the market. Waste paper demand and price trends in the future are much more interesting but are much less understood. Since the waste paper market is part and parcel of the pulp and paper industry, the prospects for the market are intimately linked to the fortunes of this industry.

Forecasts for the pulp and paper industry over the next ten years are generally optimistic(9). Similarly, paper recycling is expected to expand at a rate equal to and perhaps in excess of the paper industry(10). However, while long run trends toward recycling are evident, there are no guarantees that fluctuations in demand and prices could not occur again in the future(11). The discouraging effect which these wide fluctuations have on investment in recycling has already been noted. Furthermore, these fluctuations discourage efforts to develop recycling as a viable and significant alternative to solid waste disposal. In other words, unless the demand for waste paper is increased significantly and steadily and waste paper markets stabilized to some degree, it is unlikely that the amounts of waste papers recycled will be sufficient to achieve a measurable savings in the financial or the environmental costs of final solid waste disposal.

There is currently a lack of reliable predictive capabilities in the secondary materials industry. The demand and price declines in the late summer and fall of 1974 caught market participants unawares. Many expected the strong demand and high prices to continue through the fall of that year(12).

Development of a predictive econometric model of waste paper markets is beyond the scope of the present study. However, previous work suggests that the following indicators might be used to predict waste paper demand:

(1) forecasts of manufacturing,
(2) paper product shipments,
(3) paper product inventories,
(4) pulp production relative to paper production.

Econometric techniques could be employed to develop a predictive model of waste paper demand using the above indicators as independent variables. The most serious barrier to this endeavor would be a lack of data, particularly up-to-date statistics on pulp and paper shipments, production and inventories. Development of such a model might well be a cooperative undertaking of dealers, mills and the provincial government.

REFERENCES: CHAPTER VI

1. Arsen Darnay and William E. Franklin, SALVAGE MARKETS FOR MATERIALS IN SOLID WASTES (Washington, D.C.: U.S. Government Printing Office, 1972), pp. 41-45.

2. T. Burrell, R. McLeod and A. Taylor, PAPER RECYCLING: A SOCIO-ECONOMIC PERSPECTIVE, VOL. 3, A Municipal Solid Wastes Management Study (Toronto: The Pollution Probe Foundation, 1975).

3. William E. Franklin, Robert A. Hunt and Sally T. Sharp, PAPER RECYCLING - THE ART OF THE POSSIBLE 1970 - 1985, (New York: The American Paper Institute, March, 1973), Chapters 1 and 2.

4. S. G. Tuchman, "The Economics of the Waste Paper Industry," Unpublished Ph.D. thesis, New York University Library, June, 1963, Chapters 6 and 7.

5. J. J. Forsythe, "Recycling of Paper," TAPPI, May, 1972, p. 681.

6. Bjorn O. Lehto, "The Economics of Recycling," TAPPI, June, 1971, p. 903.

7. Fred Iannazzi, "Secondary vs. Virgin Newsprint: Which Offers the Highest Return?" PULP AND PAPER, May, 1976, pp. 122-123.

8. Personal communication with paper stock dealers.

9. K. M. Jegr and K. M. Thompson, THE CANADIAN PULP AND PAPER INDUSTRY - THREATS AND OPPORTUNITIES: 1980 - 1990, (Pointe Claire, PQ: Pulp and Paper Research Institute of Canada, June, 1975), Chapters 1 and 2.

10. Ibid.

11. Fred L. Smith, Jr. "Wastepaper Recycling: Review of Recent Market Demand and Supply," PULP AND PAPER, September, 1975, pp. 148-151.

12. Pollution Probe, Ottawa, RECYCLING IN EASTERN ONTARIO, (Toronto: Ontario Ministry of the Environment, February, 1975), p. 109.

CHAPTER VII

OTHER USES OF WASTE PAPER

In this chapter, other present and potential uses of waste paper will be described. Quantitative information will be presented where it is available, but such information is not very abundant. The discussion in this section will be confined to describing the use and to assessing the overall potential for increasing the demand for waste paper by means of any or all of these alternative uses.

The various other uses to be considered include insulation, cattle bedding and feed, construction materials, molded food trays, combined paper with sewage sludge to promote incineration and energy recovery.

Several of these "other" uses may be considered by some authorities to be part of the pulp and paper industry, most notably the molded pulp food tray and the insulation manufacturers.

INSULATION

Used newsprint is being used to make an insulation material by the Pal-O-Pak Manufacturing Company, P. O. Box 242, Whitby, Ontario, telephone (416) 668-6814. This company shreds waste newsprint, adds chemicals for fire and vermin resistance and makes a fluffy, loose insulation material which can be blown into wall cavities or poured over ceilings.

According to Mr. C. B. Rycroft, President and General Manager, the firm uses about 200 tons of waste news per month which must be free of magazines, soiled papers and any other papers that contain sizing, such as bond or stationery. This sizing interferes with the absorption of the chemicals used in making the insulation. About 35 percent of the waste news is purchased from paper stock dealers and 65 percent is obtained from local paper drives, etc. The firm has not obtained any waste news from the municipal collection programmes of Metro Toronto. The material is received at the plant in bundles, not baled.

The product is referred to as a re-pulped cellulosic product for insulation and its "R" factor compares favorably with other insulating materials. While the Central Mortgage and Housing Corporation (C.M.H.C.) has not approved the material for use in vertical spaces, it is approved for use in horizontal spaces, i.e., ceilings. Pal-O-Pak is used extensively in all types of construction. The president of the firm asserted that they cannot keep up with current demand and that the market could easily absorb a significant increase in production capacity. The company will soon be moving to Lindsay, Ontario, to an expanded facility. There are, however, a number of uncertainties as to future expansion. In the short run, the company must purchase and instal additional equipment in order to expand its production facilities.

In the long run, growth in demand for this product could be enhanced if -

1) The CMHC would approve Pal-O-Pak for use in vertical spaces;
2) Contractors could be educated as to the advantages of using the product;
3) Insulation standards were increased.

There are a number of desirable properties associated with the use of waste news to make this product. First, the reclaimed fibres are incorporated into the infrastructure and do not again become solid wastes as would most paper products. Secondly, the use of celulose fibre insulation results in energy savings through its insulation properties. No further energy is required in its use as would be the case with fibre recovery for paper making. Finally, as far as is now known, the material is safer to instal than insulation made with asbestos. All in all, it would seem to be an ideal use for waste paper.

AGRUCULTURAL USES

Shredded newspaper can be used as a mulch. The extent of such use is unknown.

Experiments are being carried out in the Ottawa area by Canadian Bale-Mart, formerly Dundas Recycling, to use shredded news as a bedding for cattle. The estimated initial consumption for the experimental phase of this enterprise is about 200 tons per month, or 2400 tons per year. The price of newsprint must not be more than $10 to $15 per ton FOB Ottawa.

MOLDED FOOD TRAYS AND CONTAINERS

One firm in Brantford produces about 7000 tons of molded egg cartons and food trays annually. It uses waste news, corrugated clippings and other pulp substitutes to make up its furnish. Since the product will be in contact with food, cleanliness is an important requirement of the paper stock used in their mill. Consequently, about 70 percent of the paper stock used is clean pulp substitutes.

This product faces strong competition from polystyrene foam products. The polystyrene products have certain advantages to the users of these products, namely their light weight. Indeed, manufacturers of the polystyrene products have produced a report which purports to show that polystyrene foam trays have a lower, overall environmental impact associated with their manufacture and use, than do molded pulp products.(1) All in all, the potential for increasing the consumption of waste paper via this sector is not promising.

ADDITION OF WASTE PAPER TO SEWAGE SLUDGE

Disposal of sewage sludge is a major problem for sewage treatment facilities. One method is to dewater and incinerate but the sludge has such a high moisture content that large amounts of externally applied energy are required to accomplish this. It has been suggested that waste paper be added to the sludge to provide an additional BTU content that would conceivably lower the externally applied energy requirement.

An advantage of this use is that the paper need not be particularly clean or free from contaminants.

ENERGY RECOVERY

Waste paper, as the prime constituent of a refuse derived fuel, may be burned along with other solid wastes to recover heat and generate steam. Several specific projects in this area are now under study, the most notable being the Watts From Waste programme at the Lakeview Generating Station of Ontario Hydro. In addition, investigations are under way to test the use of refuse derived fuel in cement making. In these considerations, the waste paper fraction used for energy recovery is obtained through mechanical processing of bulk quantities of municipal refuse as opposed to paper recovery through source separation.

REFERENCES: CHAPTER VII

1. William E. Franklin and Robert G. Hunt, ENVIRONMENTAL IMPACTS OF POLYSTYRENE FOAM AND MOLDED PULP MEAT TRAYS - A SUMMARY. Report No. 3554-D Prepared for Mobil Chemical Company, Plastics Division, (Kansas City, Mo.: Midwest Research Institute, April 24, 1972)

CHAPTER VIII

WHAT CAN BE DONE? AN EVALUATION OF GOVERNMENT OPTIONS TO INCREASE PAPER RECYCLING

The vast quantities of waste paper currently being generated and discarded into the solid waste stream could be better utilized in two ways. First, more of this paper could be recovered for recycling. Second, waste paper could be burned along with other refuse to generate energy. These options are not mutually exclusive and each can, to a large extent, be implemented concurrently. However, the focus of the present report is on the first approach, increasing the level of paper recycling.

Increased paper recycling may be accomplished by government efforts aimed at expanding waste paper consumption by the pulp and paper industry or by developing new uses for waste paper. These efforts and activities can be undertaken at varying levels of intensity and cost. To what extent should government resources (funds and personnel) be devoted to increasing paper recycling? The level of program activity must be predicated on the benefits that are expected to be derived from increased paper recycling. These benefits are, therefore, assessed in the following section.

BENEFITS OF INCREASED WASTE PAPER RECYCLING

Two primary social benefits which are often claimed for recycling include the conservation of natural resources and savings in solid waste collection and disposal. To what extent are these benefits actually achieved by increased recycling?

It is argued that increased paper recycling will conserve forests for other uses and for succeeding generations. In order for these benefits to be attributable to paper recycling, the use of wood pulp must be displaced by waste paper pulp so that pulp wood harvesting can be reduced. There are, however, several factors which act to make these benefits somewhat elusive. If the demand for pulp and paper products continues to grow, recovery and consumption of waste paper will have to grow at a greater rate in order to offset the need for more pulp wood. Annual pulp wood production in Ontario stands at about 4 million tons and production has been growing by about 1 percent per year for several years(1). It would, therefore, require an increase in waste paper consumption by 40 000 tons each year just to supply fibre to offset the growth in wood pulp demand. Another factor is the export of market pulp. Approximately 25 percent of the wood pulp produced in Ontario is exported to the U.S. or to other nations(2). Trees would still have to be cut in order to meet this demand for virgin wood pulp. Finally, because trees and forests are generally a renewable resource, wood and forests for future generations can, at least theoretically, be ensured through public or private reforestation programs; more reliably, perhaps, than through increased recycling.

The preservation of existing forests for other uses such as recreation, watershed protection and native hunting appears to offer the greatest potential for conservation benefits. Increased recycling of waste paper could conceivably provide the fibre needed to offset forest resources that would be dedicated to recreation or to native hunting. In this context, development of waste paper supplies could be part of a resolution to some contentious Indian land claims in Northern Ontario.

In order for trees and forests that would otherwise be cut for pulp wood to be preserved, waste paper recovery and consumption must be increased each year by more than 40 000 tons each year just to offset growth.

How would increased recycling affect solid waste collection and disposal? The costs of collection would, at best, probably be the same since the separation and recovery of waste papers from solid waste streams involves costs just as does garbage collection. The impacts on final disposal are likely to be more significant. It is clear that increased recycling would divert waste paper from final disposal to a more beneficial use. This would result in a savings of landfill volume and possibly some of the costs of final disposal. Thus, increased recycling of paper would help to extend the life of scarce landfill sites in urban areas but one cannot estimate the savings in disposal costs on a pro-rated basis. The reason is that most of the costs of operating a landfill operation do not vary directly with the amount of material being buried.* Consequently, even if the amount of refuse being disposed of in a particular site is reduced by 10 - 20 percent in a given year, the actual costs of operating the landfill site will not be reduced very much.

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* The costs of operating a landfill include amortization of capital development costs, equipment depreciation and operation, labor and, in some sites, cover soil. Only cover soil and equipment operation costs vary directly with the amount of garbage being buried. The other costs including labor continue even if less garbage is being buried.

In order for increased paper recycling to achieve discernable financial savings in solid waste disposal, the amounts of waste paper diverted from final disposal would have to be large enough so that operations at a landfill site could be reduced. There would be some financial savings if, as a result of increased paper recycling, aquisition of land and development of a new landfill site could be delayed.

Even a doubling of current waste paper consumption in Ontario, from 425 000 to 850 000 tons per year, would not likely reduce significantly the annual budgets for garbage disposal in Ontario communities.

The overall environmental effect of increased paper recycling in terms of waste discharges from pulp and paper manufacturing is indeterminate. The total losses from waste paper repulping is somewhat less than the losses occurring when wood is chemically pulped. However, de-inking results in large quantities of sludge, BOD_5 and trash which must be treated and discarded in some fashion.

In 1973, the Ministry of the Environment announced four objectives for a Comprehensive Resource Recovery Program(3). These objectives are:

1) to reduce the quantity of (solid) wastes produced,
2) to recover to the greatest degree practicable the resource values in (solid) wastes,

3) to reduce to a minimum the use of land for (solid) waste disposal,

4) to achieve these objectives at least cost to the public (where "costs" include environmental as well as financial costs).

While increased paper recycling will divert solid wastes from final disposal, it will not in and of itself reduce the generation of solid wastes. Increased recycling will certainly contribute to recovering the resource values in solid wastes and, as has been shown, it will contribute to the reduction in the rate at which land is used for solid waste disposal. The extent to which increased paper recycling will help to achieve these objectives at the least cost to the public depends on the efforts which are undertaken to expand it.

Increased levels of recycling in Ontario are not likely to cause any unemployment in Ontario's northern pulp mills. Integrated paper companies are currently having difficulty finding people to work in the forests. Moreover, waste paper-using capacity could easily be phased in and absorbed by growth in demand rather than displacing wood pulp consumption and making existing facilities redundant. In fact, because waste paper recovery is a more labour intensive function than is logging and pulp manufacturing and because recycling operations are located in urban areas, increased recycling is likely to result in a net increase in employment for the province.

The foregoing analysis leads to the conclusion that the benefits of increased paper recycling, while they do exist, are somewhat limited and are very difficult to quantify. It follows, therefore, that government resources must be allocated very judiciously to programmes and efforts to increase recycling.

FURTHER IMPLICATIONS OF INCREASED RECYCLING

It is obvious that, in order to achieve a substantial increase in the consumption of waste paper in Ontario, the demand for waste paper by the paper industry will have to expand considerably. Most of the mills which have a potential to use more waste paper would require premium rather than bulk grades of paper stock and they would likely have to construct additional fine paper deinking facilities in order to use this material.

Additional quantities of premium grades are available from two primary sources:

1) printing and converting shops which dealers find uneconomic to service,
2) mixed office waste and special consideration waste papers from governments, commercial establishments, universities and many retail outlets.

Recovery of more usable premium grades would normally require higher prices to offset the additional costs of collection, sorting and efforts to develop efficient programmes of at-source separation. Under current market conditions, these higher prices would have to be generated by increased demand from mills. However, the prices of many premium grades are already high, attesting to their scarcity and the high costs of sorting and cleaning. Consequently, an important focus of government action, in addition to market development for bulk grades of waste papers, is the systematic recovery of premium grades of paper stock.

ALTERNATIVE APPROACHES TO ACHIEVING INCREASED PAPER RECYCLING IN ONTARIO

The eight major factors which constrain paper recycling in Ontario are reviewed in Tables VIII-1 and VIII-2. Possible remedial actions for each of these problem areas are indicated in the tables along with the agency or group which could implement them. These remedial actions include various programmes and actions that have been suggested in the literature and by waste paper market participants. Specific policy options to be considered for implementation were formulated from these suggestions. These options are specified as those which are intended to increase the demand for waste papers and those aimed at increasing the supply of premium grades.

ASSESSMENTS OF POLICIES AND PROGRAMMES TO INCREASE RECYCLING

The various policies and programs listed in Tables VIII-1 and VIII-2 were evaluated against the following criteria:

1) Potential effectiveness at increasing the recycling of:
    a) premium grades,
    b) bulk grades.
2) Direct financial costs and benefits to government,

TABLE VIII-1

POSSIBLE REMEDIES TO THE PROBLEMS WHICH CONSTRAIN DEMAND FOR WASTE PAPER

PROBLEM	Slow growth in Boxboard and Building Board Sectors	Fluctuations in Demand and Price of Paper Stock	Location and Design of Existing Facilities Favour Primary Wood Pulp	Lack of Products Made From Paper Stock	Quality Specifications of Final Products
POSSIBLE REMEDIES AND ACTION AGENCIES	1. Improve technology to make these products more competitive with non-paper substitutes. - Mills 2. Develop customer preferences for products made from paper stock. - Paper Product Customers - Mills - Prov. and Fed. Governments 3. Government specifications and purchases to favour boxboard and building board from waste paper. - Prov. and Fed. Governments 4. Support and encourage efforts of private firms to purchase only recycled paper products. - Paper Product Customers	1. Improve storage techniques and capabilities. - Mills - Dealers 2. Use unde-inked newspapers in high volume products such as newsprint. - Mills 3. Establish a pattern of long-term contracts for paper stock supplies. - Generators - Dealers - Mills 4. Establish a Government Sponsored Waste Paper Marketing Board. - Provincial Government - Dealers 5. Establish more mills which depend on paper stock rather than use it as supplementary fibre. - Mills	1. Direct investment in new pulping capacity to recycling mills in the south: a) Make the expansion of recycling mill capacity a condition for granting new wood limits to paper companies. - Prov. Government b) Establish liaison with mills who might install recycling capacity. - Prov. Government - Mills c) Expedite approvals and applications of new recycling mills. - Prov. Government 2. Encourage the use of paper stock in some northern mills: a) lower freight rates b) withold wood limits - Prov. Government 3. Give tax rebates to mills for using waste paper - Prov. & Fed. Gov'ts.	1. Establish a newsprint de-inking mill. - Mills - Prov. and Fed. Governments 2. Assess suitability of insulation material made from waste paper. Expand its use if feasible. - Prov. & Fed. Governments 3. Give financial and promotional support for product development. - Prov. & Fed. Governments	1. Modify quality characteristics and requirements to facilitate increased recycled content of products. - Prov. and Fed. Governments - Paper Product Customers - Mills

TABLE VIII-2

POSSIBLE REMEDIES TO PROBLEMS WHICH CONSTRAIN THE SUPPLY OF WASTE PAPER

PROBLEM	Increasing Contamination	Limited Supply of Premium Paper Stock	Logistical and Operational Problems Afflicting Dealers
POSSIBLE REMEDIES AND ACTION AGENCIES	1. Modify products and processes to make paper products more recyclable. - paper product customers - CPPA (mills) - Prov. and Fed. Governments 2. Undertake R & D source separation systems. - Prov. and Fed. Governments - Generators - Dealers	1. Initiate paper recovery programs in government establishments. - Prov. and Fed. Governments - Dealers 2. Give encouragement and support to recovery programs in private sector. - Prov. and Fed. Governments	1. Assist dealers to develop mechanical sorting devices and systems. 2. Give tax concessions to dealers. - Prov. and Fed. Governments 3. Collect and maintain better data files on waste paper markets. - Prov. Government 4. Establish a Government Sponsored Waste Paper Marketing Board. - Prov. Government - Dealers

3) Intangible costs and benefits,
4) Administrative cost and feasibility,
5) Conflicts with other government objectives, programmes or agencies.

These evaluations tended to be somewhat qualitative owing to the varying degree to which these programs could be undertaken. Moreover, while the discussions and the evaluations refer to the provincial government, many of these policy options could apply to the federal and local governments as well.

Five demand options and two supply options are recommended for implementation. Further explanation of these policies and programmes are presented below. The reasons for rejecting, at this time, a number of other possibilities are presented as well.

Recommended Demand Options

Specifications of a Minimum Recycled Content in Government Paper Purchases

In 1971, the implications of a provincial government purchasing policy that would require a minimum amount of post-consumer waste in all paper products were investigated by the Ministries of Government Services and Environment(4). At that time the following reasons were given for not making a public commitment to purchasing only recycled paper.

a) Because the government buys only fine papers, tissues and toweling, only the demand for premium grades of waste paper, not bulk grades, would be affected. Furthermore, this would serve only to push up prices of the already scarce premium grades even more.

b) A competitive advantage would accrue to one company which is already equipped to make recycled fine papers.

c) Some recycled paper products were more expensive than comparable products made from primary fibres.

In order to offset the foregoing problems, a government purchasing policy favouring recycled paper should have the following elements:

a) It should be combined with programmes to increase the supply of de-inking and pulp substitute grades.

b) Programmes should be phased in over several years to give other mills time to instal the equipment and obtain the raw materials necessary to produce recycled paper.

c) Restrictions on the kinds of paper stock fibres that are allowed should be phased in as well. Mill broke and converting wastes could be permitted for a time until mills can arrange for supplies of post-consumer paper stock.

d) Paper quality standards should be reviewed and adjusted to allow for the inclusion of more recycled paper.

Assuming that a 50 percent recycled content in provincial government paper purchases is required, an additional 2750 tons of premium grade paper stock could be consumed in one year.* While this is a rather small amount of paper stock relative to the quantities currently being traded, provincial government purchasing policies and procedures provide an important example for municipal governments, private enterprises and educational institutions. The consequence of a provincial government purchasing policy could, therefore, extend far beyond its direct effect on the fine paper product market.

A program of special recognition to firms, municipalities and institutions which buy and use recycled paper and to the paper companies that make it, could ultimately be initiated to develop interest in this activity.

Modify Paper Quality Specifications, Especially Appearance Characteristics, to Facilitate the Inclusion of More Recycled Paper in Paper Products

Much of the paper purchased and used by the government could be spottier, duller, greyer and weaker without unduly affecting the paper use. However, specification and acceptance of "lower" product quality characteristics would not be a sufficient condition for utilizing more paper stock. A minimum recycled content would also have to be specified by paper product consumers to ensure that mills will utilize paper stock and not just apply less bleaching or cleaning to their primary wood pulp. This programme should, therefore, be implemented concurrently with the previously mentioned purchasing policy.

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* The provincial government currently does purchase and use recycled papers when they are available and when they are not more expensive than comparable non-recycled products. The recycled content of fine papers and tissue type papers currently ranges from 15 percent to 100 percent.

It is conservatively estimated by Ministry of Government Services officials that the provincial government purchases directly and indirectly 5500 tons of fine papers, towels and tissues each year. At 50 percent recycled content: 5500 x .5 = 2750.

Encourage Investment in Recycling Facilities by Paper Manufacturers, Especially a Newsprint De-inking Mill

There are a variety of ways in which the government can influence business decisions. One approach would be to make the allocation of northern timber resources to paper companies conditional upon the expansion of waste paper consuming facilities elsewhere in the province. Requiring firms to consider the alternative of developing waste paper using facilities rather than expanding or building new plant capacity in the north can eventually be accomplished under the Environmental Assessment Act. However, the actual allocation of Crown timber lands is the statutory responsibility of the Ministry of Natural Resources. The agreement and cooperation of this ministry would therefore be essential to the implementation of this approach.

Legislation and regulations could be enacted to require mills to use more waste paper. Such legislation, however, would be difficult to enforce and would likely be seen as inequitable. This approach is not recommended at this time.

A third, but by no means a final, approach would be for the appropriate government officials to initiate meetings with those paper companies which are contemplating specific projects that involve recycling, particularly newspaper de-inking facilities. The objectives of these meetings would be to convey the government's interest in these projects and to explore ways of expediting them where possible. This line of action is particularly recommended at this time.

It is not recommended that the government itself build and/or operate a de-inking mill.

Undertake and Support the Development and Promotion of Uses for Waste Paper Outside the Pulp and Paper Industry

This would involve expanding efforts already under way to establish and develop markets and user preferences for secondary materials. In particular, attention should be given to generating or finding new ideas and proposals for new uses of waste paper.

In conjunction with the option to modify paper product quality specifications, a systematic investigation of the various governmental agencies that define, set and enforce product or performance standards would be important. It is often product oriented (rather than performance oriented) specifications which bar the use of recycled materials in a product or a use. The Ministry of the Environment could coordinate a review of these specifications and determine where changes could be made that would permit the use of products made from secondary materials.

Implement a Public Information Campaign to Inform Consumers of the Recycled Content of Specific Paper Products

Consumer preferences for products containing recycled materials can be realized only if consumers and other purchasers know which products contain the secondary material and to what extent. Labeling, advertising and other product design techniques could be employed to make this information more available

Demand Options Not Recommended

Four additional options to increase waste paper demand were considered and rejected at this time.

1) Requiring newsprint mills to use a minimum amount of unde-inked newspapers in their furnish,
2) Allow mills to claim tax deductions for each ton of post-consumer waste paper used,
3) Lower transportation rates,
4) Promote the export of bulk grades of waste paper.

Requiring newsprint mills to use a minimum amount of unde-inked news would impose significantly higher costs on these mills. Shipping costs to get newspapers to northern newsprint mills would be high and mills would incur increased paper machine cleaning and maintenance costs. Paper companies would further resist this measure because of their concern for the effect on newsprint brightness and cleanliness.

The tax deductions to mills appear to offer a high potential for increasing the demand for waste paper. However, it would impose high costs on the government in terms of tax revenues foregone and administration. Moreover, in order for the cost reduction from the tax concession to be large enough to begin to induce greater waste paper consumption, both federal and provincial governments must adopt the policy. This option should be deferred for further consultation with the appropriate federal agencies.

Lower transportation rates, if they could be achieved, are unlikely to significantly stimulate the demand for waste paper. Few of the mills in the north would want to use paper stock even if the material could be brought to them at much lower transportation costs.

Increasing exports of bulk grades is not feasible at this time primarily because the recent world wide economic recession has curtailed the demand for waste paper overseas. In addition, Toronto is not well situated to initiate shipments to the Orient where demand was the strongest during 1973-1974.

Recommended Supply Options

The two recommended supply options are explained briefly below. Two additional possibilities were considered, but were rejected. These are discussed as well.

Reverse the Trend Toward Increased Contamination of Waste Paper

The Ministry of the Environment could enlist the assistance of the Ministries of Consumer and Corporate Affairs and Industry and Tourism to develop guidelines or regulations intended to make products more recyclable. Special recognition could be given to firms who design their products in this manner. The

Ministry of the Environment could also fund or conduct research and demonstration projects aimed at developing efficient, at-source separation and separate collection systems. Research on cleaning and separation systems in paper mills is being carried out by the pulp and paper industry. Extra funding for these projects would undoubtedly be welcomed.

Undertake the Systematic Recovery of Premium Grades of Waste Paper From Provincial Government Establishments

A demonstration or a research project should be undertaken initially in order to

a) ascertain the quantities, qualities and locations of available papers,

b) devise and test different storage, handling and pick-up procedures,

c) assess the costs, in terms of time and materials, that a more comprehensive recovery effort would entail.

It should be noted that the Property Management Branch of the Ontario Ministry of Government Services has studied various programmes and approaches to recovering waste paper and other materials from government installations. While paper recovery is being accomplished by some government offices and by garbage removal contractors, no commitment to a comprehensive, government-wide effort has yet been made.

As with the purchasing policy described earlier, such a paper recovery programme will need the encouragement and support of political leaders as well as the civil service.

Supply Options Not Recommended

The two additional programs that were considered include

1) A Waste Paper Marketing Board,
2) Assist waste paper dealers in developing more efficient mechanical sorting and separating devices.

A waste paper marketing board to be established by the provincial government is not recommended because, among other things, it does not appear to offer any particular advantage to increasing the supply of premium grades. Moreover, such a board would be subject to the same difficulties finding buyers for bulk grades as are dealers and generators. It is clear too that the majority of waste paper market participants including dealers, mills and industrial-type generators, are not at all enthusiastic about the idea. Finally, there appear to be enough other institutional bodies, both inside and outside the government, to undertake all that needs to be done in the area of recycling. One more body would not necessarily help things and could serve only to confuse matters further.

Assistance to dealers in developing mechanical sorting and separation devices is not recommended because the potential to increase the supply of premium grades of paper stock, quickly at a relatively low cost is low. Again, there was little indication from waste paper dealers or their trade association that such assistance was needed.

REFERENCES: CHAPTER VIII

1. Statistics Canada, PULP AND PAPER MILLS, 1973, (Ottawa: Information Canada, 1975) and prior years.

2. 3 800 140 Tons, Ontario pulp production
   2 843 000 Tons consumed in Ontario
   957 140 tons = 25 percent of 3.8 million tons
   Statistics Canada, PULP AND PAPER MILLS, 1971, (Ottawa: Information Canada, 1973), p. 15.

3. Ontario Ministry of the Environment, "A Comprehensive Waste Recovery Program", (Toronto: Ministry of the Environment, No Date), p. 11.

4. G. A. Khan and K. A. Childs, "Recycled Paper - Recognition of the Waste Management Problem and Supply Policy Recommendation", Supply Project No. 9 (Unpublished Report). Sept. 15, 1971.

CHAPTER IX

CONCLUSIONS

1) The "waste paper market" is not a single entity. There are more than forty different paper stock grades with widely varying characteristics and prices. Moreover, different sectors of the paper industry use different quantities and qualities of paper stock.

2) Under the prevailing market conditions and structure, all grades of waste paper are being recovered to the extent that it is economically feasible for private firms to do so.

3) It is unlikely that waste paper consumption, if left entirely to market forces, will ever increase to the extent that paper recycling will be sufficient to achieve measurable savings in the financial or environmental costs of solid waste disposal.

4) There is a strong, rather steady demand for premium grades, and supplies of clean, easily available premium grades are limited. Government efforts should, therefore, be directed at developing additional supplies of premium grades.

5) Bulk grades are used in slow growing sectors of the paper industry and are vulnerable to wide fluctuations in demand and prices. Supplies of bulk grades are invariably in excess of demand. Consequently, government activities should be aimed at stimulating and stabilizing the demand for bulk grades of paper stock.

6) Contamination is a major constraint to waste paper recovery and recycling. The most effective way to achieve fibre recovery, whether it be bulk or premium grades, is to separate waste papers from the solid waste stream.

7) The study revealed no evidence of discriminatory shipping rates against waste paper. The published rail shipping rates for waste paper are the same as wood pulp and pulp wood. However, waste paper is not shipped frequently enough or in large enough quantities to warrant the lower negotiated rates which integrated pulp and paper mills are able to obtain.

8) Competition among dealers for waste paper supplies and for customers along with the ease of entry into the market precludes any dealers from manipulating prices of waste paper to generators or mills.

9) The scope for increasing the consumption of bulk grades of paper stock in existing Ontario mills is limited.

10) Existing mills would be able to use substantially more premium grades but would require additional fine paper de-inking facilities.

11) Construction of a newsprint de-inking mill offers the greatest potential in the paper industry to both stabilize and increase the demand for waste newspapers.

12) The manufacture of a cellulosic insulating material from waste newspapers offers the greatest potential for increased waste paper demand outside the paper industry.

13) Energy recovery is probably the best use, at present, of waste papers which end up in the solid waste stream.

14) The ability of provincial government actions to directly increase bulk grade demand and high grade supplies is limited. However, provincial government policies and programmes provide an example to other sectors of the economy.

CHAPTER X

RECOMMENDATIONS

It is recommended that the Ontario Government set an example to other sectors in the province and the economy by implementing a number of actions which are intended to increase the level of paper recycling.

The recommended actions should be implemented in stages in order to allow for necessary adjustments by the relevant parties. In addition, any actions which might be directed at increasing the supply of bulk grades (waste news, corrugated, mixed papers) should be implemented only after there are definite customers for these papers.

IMPLEMENT A RECYCLING PROGRAMME WITHIN THE ONTARIO GOVERNMENT

The Ministry of Government Services, in conjunction with the Ministry of the Environment and other appropriate agencies, should implement a paper recycling programme within the provincial government establishment in Toronto. This programme would have four primary elements.

1) Review quality characteristics of paper products used by the government and, where feasible, alter these characteristics to permit the inclusion of more waste paper.
2) Specify, where feasible, a minimum recycled fibre content and more "recyclable" designs in the paper products purchased by the provincial government.

3) Undertake an organized, systematic fine paper recovery programme throughout provincial government buildings.
4) Publicize the programme and the methods used to implement the programme in order to provide other public and private waste paper generators with guidelines and technical assistance about purchasing recycled paper, altering product characteristics to favour recycling, recovering high value grades of waste paper and selling the recovered material.

ENCOURAGE INVESTMENT IN RECYCLING FACILITIES, PARTICULARLY WASTE NEWS DE-INKING

The Ontario government has jurisdiction over two factors which are vital to the pulp and paper industry: wood and waste disposal. Consequently, it is recommended that the Ministry of the Environment enter into discussions with the Ministry of Natural Resources concerning the government's policy toward paper recycling.

Representatives of the Provincial government should meet with paper companies to discuss specific proposals and projects concerning recycling.

The object of these meetings would be to explore ways to expidite specific projects that would increase the demand for waste paper.

DEVELOPMENT OF OTHER USES FOR WASTE PAPER

It is recommended that the Ministry of the Environment, the Ontario Ministry of Energy and the federal government undertake or sponsor an investigation of the properties of an insulating material made from waste newspapers. In particular, the suitability of this material in federally and provincially financed construction should be determined.

Proposals for R & D into new products from waste paper should be encouraged.

MAINTAIN DATA AND INFORMATION FILES

A dearth of readily available statistical data on prices and quantities in the waste paper market was an important constraint to completing this study and to assessing policies which concern paper recycling. It is, therefore, recommended that the Ministry of the Environment, in collaboration with the Ontario Statistical Centre of the Ministry of Treasury, Economics and Intergovernmental Affairs, establish and maintain data files about the markets for waste paper and other secondary materials. These files could be stored and made accessible by the Ontario Statistical Centre.

PROVIDE INFORMATION TO CONSUMERS ON RECYCLED CONTENT AND ON PRODUCTS WHICH ARE DIFFICULT TO RECYCLE

Technical information should be assembled and a public information campaign mounted to disseminate this information to government and corporate buyers as well as individual consumers.

APPENDIX A

PAPER STOCK CONSUMPTION IN ONTARIO AND CANADA

TABLE A-1

DISTRIBUTION OF PAPER STOCK CONSUMPTION BY GRADE - CANADA, 1971 - 1974

Grade	1971 Ton	1971 %	1972 Ton	1972 %	1973 Ton	1973 %	1974 Ton	1974 %
Pulp substitutes	109 493	13.4	99 070	11.2	138 749	16.0	145 633	16.0
De-inking grades	51 634	6.1	39 348	5.0	62 664	7.1		
Corrugated containers	331 450	40.4	414 084	48.4	389 463	44.3	455 070	50.0
Newspapers	89 208	11.0	106 420	12.4	91 829	10.4	92 285	10.0
Mixed paper (including boxboard cuttings)	162 950	20.0	197 049	23.0	196 306	22.2	214 588	24.0
Unidentified	74 505	9.1	-	-	-	-	-	-
Total paper stock:	819 240	100.0	855 971	100.0	879 011	100.0	907 576	100.0
Total specialty grades, rejected rolls and purchased broke	-		300 746		230 518		-	
GRAND TOTAL:	-		1 156 717		1 109 529		-	

SOURCE: 1971 data: G.H. Manning and M.S. Conway, Consumption of Paper Stock in Canada, 1971, Information Report E-X-21 (Ottawa: Forest Products Research Institute, 1973).
1972 and 1973 data: M.J. Frost, Report on Consumption of Recycled and Reclaimed Fibre in Canada, (Montreal: CPPA, 1972, 1973).
1974 data: Personal communication from H.D. Paavila, Director, Environmental Services, CPPA, Montreal.

TABLE A-2

WASTE PAPER CONSUMPTION - CANADA (excluding rolls and sheets on skids)

Type of Waste Paper	1971 ton	1972 ton	1973 ton	1974 ton
Premium grades				
Pulp substitutes	109 493	99 070	138 749	-
De-inking	51 634	39 348	62 664	-
Total:	161 127	138 418	201 413	145 633
Bulk grades				
Corrugated containers				
- old corrugated cuttings	236 602	296 565	247 557	330 499
- new corrugated cuttings	91 278	117 519	141 906	124 571
Total:	331 450	414 084	389 463	455 070
Newsprint	89 208	106 420	91 829	92 285
Mixed paper				
- mixed	93 578	109 716	110 382	129 500
- boxboard cuttings	68 972	85 413	85 879	85 088
Total:	162 950	197 049	196 306	214 588
TOTAL:	819 240	855 971	879 011	907 576

SOURCE: 1971 data: G.H. Manning and M.S. Conway, Consumption of Paper Stock in Canada, 1971, Information Report E-X-21 (Ottawa: Forest Products Research Institute, 1973).

1972 and 1973 data: M.J. Frost, Report on Consumption of Recycled and Reclaimed Fibre in Canada (Montreal: CPPA, 1972, 1973).

1974 data: Personal communication from H.D. Paavila, Director, Environmental Services, CPPA, Montreal.

TABLE A-3

DISTRIBUTION OF PAPER STOCK CONSUMPTION BY REGION, 1972, 1973

Grade	Ontario Ton	%	Quebec Ton	%	All Other Provinces Ton	%	Canada Ton	%
Mixed paper								
1972	82 503	22	74 951	22	39 595	27	197 049	23
1973	75 364	18	93 445	32	27 497	17	196 306	22
News								
1972	44 518	12	43 807	13	18 095	13	106 420	12
1973	56 530	13	17 636	6	17 663	11	91 829	10
Corrugated container grades								
1972	177 639	47	158 301	47	78 144	54	414 084	48
1973	166 337	39	118 760	40	104 366	66	389 463	44
De-inking grades								
1972	22 760	6	15 375	5	1 213	1	39 348	5
1973	43 983	10	15 794	5	2 887	2	62 664	7
Pulp substitutes								
1972	50 195	13	41 049	12	7 826	5	99 070	12
1973	82 944	20	49 979	17	5 826	4	138 749	17
TOTAL PAPER STOCK:								
1972	377 615	100	333 483	100	144 873	100	855 971	100
% used in each region		44		39		17		100
1973	425 363	100	295 614	100	158 034	100	879 011	100
% used in each region		48		34		18		100

..... continued

TABLE A-3 continued

Grade	Ontario Ton	%	Quebec Ton	%	All Other Provinces Ton	%	Canada Ton	%
Specialty grades, rejected rolls and purchased broke								
1972	49 830		185 297		65 619		300 746	
1973	67 652		106 817		56 049		230 518	
GRAND TOTAL:								
1972	427 445		518 780		210 492		1 156 717	
% used in each region		37		45		18		100
1973	493 015		402 431		214 083		1 109 529	
% used in each region		44		36		20		100

SOURCE: M.J. Frost, Report on Consumption of Recycled and Reclaimed Fibre in Canada, 1973 (Montreal, CPPA, 1973, 1974).

TABLE A-4

CONSUMPTION OF PAPER STOCK GRADES - ONTARIO AND CANADA, 1971 - 1973

Grade PS-74 No.	Grade Name	Ontario (ton) 1971	Ontario (ton) 1972	Ontario (ton) 1973	Canada (ton) 1971	Canada (ton) 1972	Canada (ton) 1973
	Pulp Substitutes						
15-11	Used brown kraft	5 863		14 367	13 116		18 817
18	New coloured kraft			313	3 000		1 106
19	New brown kraft			17 643	2 500		20 502
	Brown kraft	3 125	8 359		7 490	27 406	
22	Mixed shavings	750		1 215	3 825	480	4 274
23	#1 Groundwood shavings			13 386			30 994
24	White news blanks	2 475	11 136		10 603	14 810	
27	Fly leaf shavings	375		1 877	1 724	2 814	3 154
28	Soft-white shavings	5 925	6 097	6 200	11 160	6 399	6 375
30	Hard-white shavings	6 850	5 440	5 485	11 540	8 519	7 610
31	Hard-white envelope cuttings	1 925	N/A	5 433	14 900	N/A	11 059
33-34	New coloured envelope cuttings	2 125	N/A	21	2 125	N/A	3 499
	Total Envelope Cuttings (31, 33-34)	4 050	2 084	5 454	17 025	12 205	14 558
36	Coloured tab cards	1 950	N/A	250	3 198	N/A	303
37	Manila tab cards	7 455	N/A	13 912	11 073	N/A	16 612
	Total tabulating cards (36, 37)	9 405	17 079	14 162	14 271	19 862	16 915
46	Unprinted bleached sulphate	500		2 533	11 250	6 575	14 135
26	Publication blanks	1 237		309	1 987		309
	PULP SUBSTITUTES TOTAL:	40 555	50 195	82 944	109 493	99 070	138 749
	Specialty grades, rejected rolls, and purchased broke		23 506	47 739		130 478	109 612
	TOTAL INCLUDING REJECTED ROLLS:		73 701	130 683		229 548	248 361

..... continued

TABLE A-4 continued

Grade PS-74 No.	Grade Name	Ontario (ton)			Canada (ton)		
		1971	1972	1973	1971	1972	1973
	De-inking Grades						
38	#1 Sorted coloured ledger	20 352	20 062	35 036	23 580	20 980	38 510
40	Sorted white ledger	2 250	2 698	530	4 078	6 437	7 103
41	Manifold white ledger	675			4 167		
42	#1 Old magazines			3 544	2 497	10 740	5 044
43	Book stock			3 059			3 198
44	Printed bleached sulphate cuttings	8 312		1 814	17 312		8 809
	Printed envelopes					1 191	
	DE-INKING GRADES TOTAL:	31 589	22 760	43 983	51 634	39 348	62 664
	Corrugated Container Grades						
10	Solid fibre container				3 570		
11	Used corrugated container	94 790	145 375	92 049	236 602	296 565	247 557
12-13	New corrugated cuts	35 011	32 264	74 288	91 278	117 519	141 906
	CORRUGATED GRADE TOTAL:	129 801	177 639	166 337	331 450	414 084	389 463
	Newsprint Grades						
6	Used newspaper	34 838	31 903	28 451	66 960	88 315	60 942
7	Super news				350		
9	Over-issue news	11 613	12 615	28 084	21 898	18 105	30 887
	NEWSPRINT TOTAL:	46 451	44 518	56 535	89 208	106 420	91 829
	Total rejected rolls		26 324	20 113		170 268	120 906
	TOTAL INCLUDING REJECTED ROLLS:		70 842	76 648		276 688	212 735

..... continued

TABLE A-4 continued

Grade PS-74 No.	Grade Name	Ontario (ton) 1971	Ontario (ton) 1972	Ontario (ton) 1973	Canada (ton) 1971	Canada (ton) 1972	Canada (ton) 1973
	Mixed Paper Grades						
2	Mixed paper	24 760	41 177	28 086	93 578	109 716	110 382
4	Boxboard cuttings	32 020	41 326	47 233	68 972	85 413	85 879
5	Mill wrappers			45	400	1 920	45
	MIXED PAPER TOTAL:	56 780	82 503	75 364	162 950	197 049	196 306
47	Miscellaneous	66 937			74 505		
	GRAND TOTALS						
	PAPER STOCK	372 113	377 615	425 363	819 240	855 971	879 011
	SPECIALTY GRADES, REJECTED ROLLS, AND PURCHASED BROKE	-	49 830	67 852	-	300 746	230 518
	TOTAL:	372 113	427 445	493 015	819 240	1 156 717	1 109 529

SOURCE: 1971 data: G.H. Manning and M.S. Conway, Consumption of Paper Stock in Canada, 1971, Information Report E-X-21 (Ottawa: Forest Products Research Institute, 1973).
1972 and 1973 data: M.J. Frost, Report on Consumption of Recycled and Reclaimed Fibre in Canada (Montreal: CPPA, 1972, 1973).

N/A - figures not available

APPENDIX B

PAPER STOCK DEALERS AND BROKERS OPERATING IN ONTARIO, 1975

APPENDIX B

PAPER STOCK DEALERS AND BROKERS OPERATING IN ONTARIO, 1975

As explained in the text, firms enter or leave the waste paper business according to market conditions. Consequently, no listing of waste paper dealers and brokers can be complete for very long. The firms listed here have either been long established in the business or they are, at this writing, handling at least 1000 tons of waste paper each year. Firms in the U.S. which sell regularly to Ontario mills are also included.

TORONTO AREA

1. D. Benedetto, Inc.,
New York, N.Y.

This company owns or controls three large established waste paper firms in Toronto:

- Mill Paper Fibres, Toronto Paper Fibres, and Levis Paper Fibres Ltd.

These three firms are referred to as the Benedetto Group. It is reported that D. Benedetto is, in turn, controlled by Robert Gair Co. of New York and Gair Co. of Canada Ltd., Toronto.

2. Buscombe and Dodds Ltd.,
255 Wellington Street, West,
TORONTO, Ontario.
(416) 363-1444
Affiliation: None
Contact: Mr. Gallagher, Vice-president.

3. Consolidated Fibres of Ontario Ltd.,
95 Commissioners Road,
TORONTO, Ontario. M5A 1A6
(416) 461-0211
Affiliation: Owned by Consolidated Fibres, Buffalo.
Canadian Paper Fibres Co. (Toronto).
Paper Fibres of Canada.
Contact: Paul Clairfield, President.

This company is the largest dealer/broker in Ontario.

4. Data Surplus Cards,
1860 Shawson Drive,
MISSISSAUGA, Ontario.
(416) 622-0606.
Affiliation: None
Contact: William Telfer, General Manager.

This company handles tab cards and print-out papers only.

5. Elliot Krever and Associates Ltd.,
150 Consumers Drive, Suite 105,
WILLOWDALE, Ontario. M2J 1P9
(416) 491-4147.
Affiliation: Owns some other firms.
Contact: Elliot Krever, President.

This firm is a broker only.

6. Levis Paper Fibres Ltd.,
199 Eastern Avenue,
TORONTO, Ontario. M5A 1H7
(416) 364-7211.
Affiliation: Subsidiary of Mill Paper Fibres.
Benedetto Group.
Contact: Mark E. Rose, Vice-president and General Manager.

7. McCall Carton Services,
145 Queenslea Avenue,
WESTON, Ontario. M9N 2L1
(416) 241-3617.

8. Mill Paper Fibres Ltd.,
20 Trinity Street,
TORONTO, Ontario. M5A 3C5
(416) 364-6255.
Affiliation: Benedetto Group.
Contact: Peter Mateer, Vice-president and General Manager.

9. Reed Paper Ltd., Recycling Division,
145 King Street, West, 25th Floor,
TORONTO, Ontario. M5H 1J8
(416) 862-5000, 463-5901.
Affiliation: Division of Reed Paper Ltd., formerly (Dan) Krever
Paper Stock Co.
Contact: Ken Rooney, General Manager.

This company buys papers primarily for Reed Paper Mills, but sells to other mills as well.

10. Stanton Paper Fibres Ltd.,
44 Howden Road,
SCARBOROUGH, Ontario. M1R 3E4
(416) 752-6460
Affiliation: Independent.
Contact: Joseph Stanton, President.

11. Textile and Paper Waste Sales Ltd.,
116 George Street,
TORONTO, Ontario. M5A 2M5
(416) 362-1616

12. Toronto Paper Fibres Ltd.,
199 Eastern Avenue,
TORONTO, Ontario. M5A 1H7
(416) 363-0969.
Affiliation: Benedetto Group.
Contact: Mark Rose, General Manager.

13. IKO Industries Ltd.,
71 Orenda Road,
BRAMPTON, Ontario. L6W 1V8
(416) 677-2827.
Affiliation: Subsidiary of IKO Industries Ltd.
Contact: Gene Powell.

This firm, located in Brampton, buys and sells waste paper to other mills as well as to the Brampton roofing mill.

BUFFALO, N.Y. AREA

1. Consolidated Fibres Inc.,
600 Statler Building,
BUFFALO, N.Y. 14202.
(716) 849-8484.
Affiliation: Formerly a subsidiary of Browning-Ferris Industries Inc., a large waste handling and disposal company.
Contact: Haskell Stovroff, President.
Richard Gordon, Vice-president.

One of the largest firms of its kind in the U.S., Consolidated acts as both a broker and a dealer. This firm sells to mills in Ontario directly and through its Ontario subsidiary.

2. Great Lakes Paper Fibre,
BUFFALO, N.Y.
(716) 854-3232.
Affiliation: D. Benedetto Co.
Contact: Owen Murray, Manager.

HAMILTON AREA

1. Hamilton Recyclists,
77 Merchison,
HAMILTON, Ontario.
(416) 547-4027.

2. Mill Paper Fibres,
   162 Ferguson North,
   HAMILTON, Ontario.
   (416) 522-6116.

   See Mill Paper Fibres, Toronto.

KINGSTON AREA

1. Kingston Iron and Metal Co.,
   140 Rideau Street,
   KINGSTON, Ontario.
   (613) 544-1822.
   Contact: Mr. Warren

   This firm is primarily a scrap metal dealer, but does handle some waste paper.

LONDON AREA

1. Gold and Gold Recycling Industries Ltd.,
   555 Bathurst Street,
   LONDON, Ontario.
   (519) 672-9000.

BRANTFORD AREA

1. Ennis-Scory Fibres Ltd.,
   302 Murray Street,
   BRANTFORD, Ontario.
   (519) 756-5264.

NORTH BAY AREA

1. Mr. E. F. Martinello,
   851 Maple Grove Drive,
   NORTH BAY, Ontario.

OTTAWA AREA *

1. Big "G" Recycling Co.,
   77 Burland,
   OTTAWA, Ontario.
   (613) 820-0150.
   Contact: Jim McNabb

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* Detailed information on these and other smaller dealers may be found in Pollution Probe-Ottawa, Recycling in Eastern Ontario, (Toronto: Ontario Ministry of the Environment, Feb., 1975), Chapter IV.

2. Dundas Recycling,
   9 Linebank Road,
   Box 616, R.R. #5,
   OTTAWA, Ontario.
   (613) 731-6341.
   Contact: Bob Boulanger.

3. Florence Paper Co.,
   2475 Sheffield Road,
   OTTAWA, Ontario.
   (613) 745-9437.
   Affiliation: Independent.
   Contact: Al Smith.

   This firm is the largest dealer in the Ottawa area.

4. M. Levinson Salvage,
   271 St. Redempteur,
   HULL, P. Q.
   (819) 777-4325.
   Contact: Syd Greenberg.

5. Valley Waste Paper,
   ARNPRIOR, Ontario.
   (613) 623-6841.
   Contact: Bill MacMeechan.

6. Zigman Metal Co.,
   237 Bartbolowner,
   BROCKVILLE, Ontario.
   (613) 342-2929.
   Contact: Ms. E. Nowell.

APPENDIX C

BOXBOARD, CONTAINER BOARD
AND BUILDING BOARD MARKETS

APPENDIX C

BOXBOARD, CONTAINER BOARD AND BUILDING BOARD MARKETS

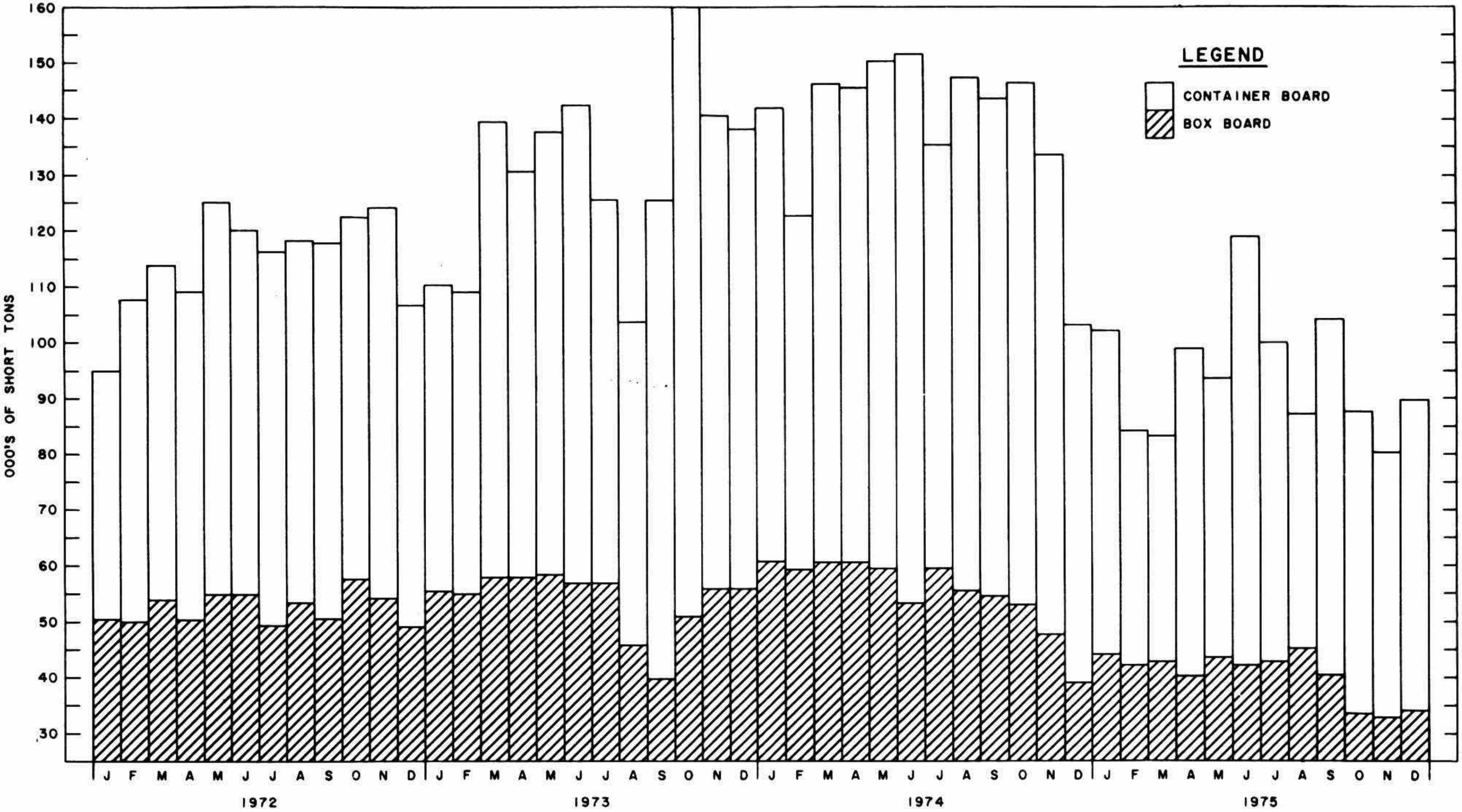
Monthly shipments of boxboard and container board (corrugated medium and linerboard) from Canadian mills are plotted in Figure C-1. Shipments primarily reflect purchases by customers of the products so that these data indicate short run shifts in demand as well as long run trends. The rather large decline in shipments during the summer of 1973 was due to a railroad strike which occurred at that time. The very low level of boxboard output registered in the fall of 1975 is due to strikes that closed down much of the Canadian pulp and paper industry at that time.

Long term growth in boxboard markets has been particularly disappointing relative to other product sectors. While production of all paper products in Canada, excluding newsprint, has grown by 91 percent between 1964 and 1974, the output of all grades of boxboard increased by only 40 percent(1). Folding boxboard is a particuarlarly large user of paper stock. As is indicated in Table C-1, annual production of this product in Ontario has not increased at all between 1965 and 1972.

Two factors are primarily responsible for slow growth in the boxboard sector. First, customers have been shifting to other materials, notably plastics, or to bleached kraft boxboard. Second, demand for the products which are packaged in boxboard, foods, soap powders, shoes, etc., grow relatively slowly.

The building board market is keyed to construction activity while container board (corrugated boxes) demand is sensitive to the

FIGURE C-I
BOXBOARD AND CONTAINER BOARD, MONTHLY TOTAL SHIPMENTS



SOURCE: CANADIAN PULP AND PAPER ASSOCIATION, THE PULP AND PAPER STATISTICAL REVIEW level of manufacturing activity. Thus, provincial policies to expand housing will indirectly have an impact, if the policies are successful, on the demand for waste papers.

Growth in demand for container board is dependent on the recovery of the U.S. as well as the Canadian economies. Indeed, future growth in all three of these product sectors depends on an overall recovery of the economy.

TABLE C-1

PRODUCTION OF BOXBOARD BY CANADIAN AND ONTARIO PULP AND PAPER MILLS

(000 Tons)

Year	Folding Boxboard		Nonfolding Boxboard		Solid Bleached Boxboard		Total Boxboard	
	Canada	Ont.	Canada	Ont.	Canada	Ont.	Canada	Ont.
1965	265	118	104	50	89	C	707	C
1966	278	109	112	58	103	C	738	C
1967	264	101	119	59	78	C	739	C
1968	264	102	122	63	73	C	742	C
1969	267	99	125	68	93	C	794	C
1970	250	88	111	65	107	C	701	C
1971	258	95	115	69	98	C	685	C
1972	277	105	120	70	116	C	758	C
1973	268	---	131	--	93	C	917	C
1974(1)	281	---	130	--	108	C	918	C

C= Confidential, Figures not available.

(1)Estimate by CPPA

SOURCE: Statistics Canada, Annual Census of Industry, Special Compilation.

REFERENCES: APPENDIX C

1. Canadian Pulp and Paper Association, REFERENCE TABLES: 1975, (Montreal: CPPA, 1975), p. 27.

APPENDIX D

POSSIBILITIES FOR INCREASING THE CONSUMPTION OF PAPER STOCK BY ONTARIO PAPER MILLS

APPENDIX D

POSSIBILITIES FOR INCREASING THE CONSUMPTION OF PAPER STOCK BY ONTARIO PAPER MILLS

The extent to which waste papers can be substituted for virgin pulp in existing Ontario mills is assessed in the following paragraphs. Mills with some potential for using more wastepaper are identified on the basis of the following criteria.

1) Location - the further north, the lower the potential.
2) Technical Feasibility - mills which currently have waste paper capacity and which use equipment that could be adapted to waste paper have a high potential.
3) Exports - mills which produce products for export have less potential for substitution than mills producing for domestic consumption.
4) Integrated/non-integrated - non-integrated mills have a higher potential for recycling than do integrated mills.
5) The ratio of paper-making capacity to pulp-making capacity - where paper-making capacity is equal to or exceeds pulp-making capacity, the potential for expanding pulp production using waste paper is greater.

The mills that are discussed in this Appendix are listed in Tables IV-4 and IV-5.

NEWSPRINT

Newsprint is by far the dominant product of the Ontario pulp and paper indsutry, accounting for almost 47 percent of the total output of paper and board in this province. All of these mills make newsprint from primary wood pulp fibre.

There are two ways in which waste paper might be used in this sector. First, existing mills may add a small amount (up to 5 percent by weight) of unde-inked waste newspapers directly into their furnish. The second approach is to de-ink waste news to make more newsprint.

Besides the obvious problem of high transportation costs for shipping waste newspapers from urban areas to northern mills, the study revealed a number of other reasons why Ontario newsprint companies are generally unwilling to supplement their furnish with unde-inked newspapers. First, most of these mills do not have the loading, handling and storage facilities for waste papers. Waste newspapers must be stored indoors and require "hydrapulpers" to pulp. Wood, on the other hand, is stored out of doors until it is used. Then it is either pulped in grinders (ground wood) or in chemical pulpers (kraft or sulfite). Second, experience at mills that have used the unde-inked waste news has revealed that ink and other contaminants will cause more down time on the paper machine due to cleaning and repairs. Finally, the inks in the old newspaper will cause spotting and greying of the newsprint. Mills would have a lower quality product or they would have to bleach the resulting pulp at an added cost.

Because it is located far from its pulp wood sources, the Ontario Paper Co. is the only newsprint mill in Ontario that has tried using unde-inked waste news. As noted, the use of this material has resulted in having to instal special cleaning and washing devices on the paper machine and, in some instances, additional bleaching of the pulp. Because of its pulp wood supply situation, Ontario Paper is seriously contemplating the establishment of a newspaper de-inking mill. The Beaver Wood Fibre Co., located adjacent to the much larger Ontario Paper Co. mill, also makes newsprint. However, Beaver Wood Fibre would not consider installation of a de-inking plant because it purchases all of its sulfite pulp from Ontario Paper.

Ontario Paper Co. has not made a decision on the de-inking plant for the following reasons:

1) uncertainties about the profitability of such a facility because of the fluctuating price of waste news,
2) consideration of other processes such as thermo-mechanical refining,
3) uncertainties about growth in newsprint demand and general economic recovery.

Supply of waste news is not considered a limiting factor by officials at Ontario Paper.

CONTAINER BOARD

There are five mills in Ontario which currently make corrugating medium, liner board or both. A sixth mill has just come on line in the summer of 1976 which will use 100 percent reprocessed fibre, primarily old corrugated boxes, to make both linerboard and corrugating medium. Two of the five existing mills are non-integrated recycling mills while the other three are integrated wood pulp and paper mills.

Domtar Packaging in Trenton is an integrated NSSC mill but uses container board clippings from converting operations to supplement its furnish.* These clippings are essentially pulp substitutes which need almost no cleaning. Both the Abitibi mill at Sturgeon Falls and the Domtar Construction mill at Red Rock are located far from the sources of waste paper and both appear to have some excess pulping capacity. Consequently, these mills have a very low potential to use post-consumer, corrugated boxes.

When operating at its intended production level, the new recycling mill in Mississauga will increase the demand for old corrugated boxes in Ontario by 45 percent. It is expected that the operation of this mill will stimulate a more complete utilization of old corrugated boxes and that the problem concerning this grade will become one of generating acceptable supplies rather than establishing additional demand.

FINE PAPERS

Of the six fine paper mills in Ontario, only the Abititi mill in Thorold uses paper stock to any appreciable degree, and the paper stock which it uses is exclusively pulp substitutes or de-inking grades. The two Domtar mills in Cornwall and St. Catharines consume small amounts of converting wastes. The rest of the mills are dependent on primary fibre.

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* NSSC = Neutral sulphite semi-chemical.

It would require the installation of a de-inking process for any of these fine paper mills to use significantly larger amounts of waste paper. Moreover, higher prices would be required to stimulate additional recovery of high grade waste papers. Transportation would be another important cost factor.

The two Domtar mills and the E. B. Eddy mill in Ottawa would be in the best locational position to utilize more paper stock. However, the Eddy mill produces about 200 000 tons of kraft pulp each year. Hence, Eddy would have to compare the added costs of the waste paper, of de-inking and of transportation with the price received for the kraft pulp that would be "freed up" for sale in order to make a decision.

The kraft pulping and paper machine capacity of the Domtar, Cornwall mill seems to be in balance. Increases in output from that facility could, therefore, come about either by expanding the kraft pulping facility or by de-inking premium grades of waste paper. Domtar officials reported that they are investigating the feasibility of a de-inking facility at Cornwall but have so far decided not to instal the facility for several reasons. First, they felt that there were not enough recoverable premium grade papers generated in Toronto and Montreal to support the additional amount of consumption they were contemplating. Moreover, such a project would put Domtar in direct competition with Abitibi, Thorold for de-inking grades of waste paper. This extra demand would likely drive the prices of existing supplies of de-inking grades up to the extent that the operation might not be economic.* Finally, a de-inking operation generates a large amount of solid wastes and suspended solids in water. Any new de-inking facilities which generate wastes would have to be certified by the Ministry of the Environment. Waste treatment and disposal would likely be an important additional cost for the de-inking operation.

Consequently, the primary constraint to increased waste paper consumption in this sector is the availability of clean premium grade of paper stock at current prices. Marketing (product quality) considerations are also of importance to fine paper mills. Specification of recycled fibre content coupled with less stringent whiteness and cleanliness requirements might enhance recycling in this sector.

TISSUES

Of the four tissue mills in Ontario, the two Kimberly-Clark mills at St. Catharines and Huntsville use pulp substitutes and ledger (de-inking) grades to the extent that about 40 percent of the total output of each of these mills is composed of recycled fibre. Kimberly-Clark also has a small tissue mill in Kapuskasing which uses kraft pulp from the large pulp mill located nearby. The Dominion Cellulose mill owned by Canadian International Fibre and located in

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* A total of 83 000 tons of pulp substitutes and 44 000 tons of de-inking grades (or 127 000 tons total) were consumed in Ontario in 1973. The output of the Domtar Cornwall de-inking facility was estimated to be 50 000 tons per year. With a 20 percent loss, the mill would need 60 000 tons of waste paper. 60 000 tons is 40 percent of 127 000 tons. A 40 percent increase in demand without additional efforts at supply generation would likely raise prices, perhaps by an even higher percentage.

Toronto uses only bleached and semi-bleached kraft market pulp.

Quality factors such as softness, strength and cleanliness are emphasized for these products. The waste paper used in these mills is restricted to a very high quality in terms of contaminants and the material is tested for bacterial content at each mill.

Increased use of waste paper by any or all of the three tissue mills located in southern Ontario would be contingent on the availability of very clean pulp substitute and de-inking grades of paper stock. These mills would also have to incur some additional costs of cleaning, de-inking, bleaching and waste disposal, although to a great extent these facilities are already in place. The economic feasibility of making the investments necessary to use waste paper is also questionable because of the small size of the mills in question. The waste disposal issue is particularly critical in the St. Catharines-Thorold area where five other paper mills are located.

High prices and scarcity of market pulp have induced at least two tissue mills to utilize more waste paper stock. Nevertheless, marketing factors, health considerations and the problem of waste disposal provide strong incentives to use virgin fibre when it is available.

BOXBOARD

Boxboard mills in Ontario are currently using almost 100 percent in their products. As noted in the text, an increase in waste paper consumption would require that the total demand for boxboard products be expanded. It has also been noted in Appendix C that demand for these products has been growing very slowly over the past several years. Although there is likely to be a substantial increase in paper demand and waste paper consumption after the current (4th quarter of 1975 and 1st quarter of 1976) recession, it is not likely that continued growth in the demand for boxboard products will be any greater than it has in the past. Increased waste paper consumption in this sector is dependent on the preferences of consumers for combination rather than bleached kraft boxboards. Marketing and cost factors currently favour bleached kraft board and other products. It is difficult to see how provincial government actions could change these advantages directly or over a short period of time.

APPENDIX E

TRADE ASSOCIATIONS RELEVANT TO RECYCLING PAPER

APPENDIX E

TRADE ASSOCIATIONS RELEVANT TO RECYCLING PAPER

1. Canadian Association of Recycling Industries
   5799 Yonge Street
   Willowdale, Ontario
   M2M 3V3
   (416) 221-1191
   Ms. Lynn McKay, Executive Director
   Re: Paper Stock, Paper Dealers.

2. Canadian Corrugated Case Association
   1 Yonge Street
   Toronto, Ontario
   (416) 363-7261
   Re: Container board, corrugated box converters.

3. Canadian Daily Newspaper Publishers Association
   250 Bloor Street East
   Toronto, Ontario
   (416) 364-7362
   Mr. Templar
   Re: Newsprint consumption and newspaper circulation.

4. Canadian Paper Box Manufacturers Association
   185 Bay Street
   Toronto, Ontario
   (416) 364-7362
   Mr. William Bainbridge
   Re: Boxboard manufacturing and converters.

5. Canadian Pulp and Paper Association
   2300 Sun Life Building
   Montreal, Quebec
   (514) 363-8374
   Mr. H. D. Paavila, Director, Environmental Services.
   Re: Manufacturing of all papers, utilization of Paper Stock.

6. Envelope Makers Institute of Canada
   55 York Street
   Toronto, Ontario
   (416) 363-8374
   Mr. Ivan Moffitt
   Re: Envelope manufacturing.

7. Ontario Weekly Newspapers Association
   591 Argus Street
   Oakville, Ontario
   (416) 844-0184
   Re: Newsprint Consumption and newspaper circulation.

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Paper recycling in Ontario /
Donnan, J. A.
78751